EDGEWOOD ARSENAL: AN INSTALLATION ENVIRONMENTAL IMPACT ASSESSMENT

Scott E. Downing, et al

Edgewood Arsenal
Aberdeen Proving Ground, Maryland

July 1975

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This Installation Environmental Assessment (IEA) is designed to assemble, in one document, data pertinent to Edgewood Arsenal's impact on the environment. This IEA is a source document for use in conjunction with Environmental Impact Statements and Environmental Assessments prepared on projects performed at Edgewood Arsenal. The information contained herein was collated from existing data only; no attempt to acquire new data has been made. This report deals with the entirety of Gunpowder Neck and associated island and peninsulas comprising the Edgewood Area of Aberdeen Proving Ground.

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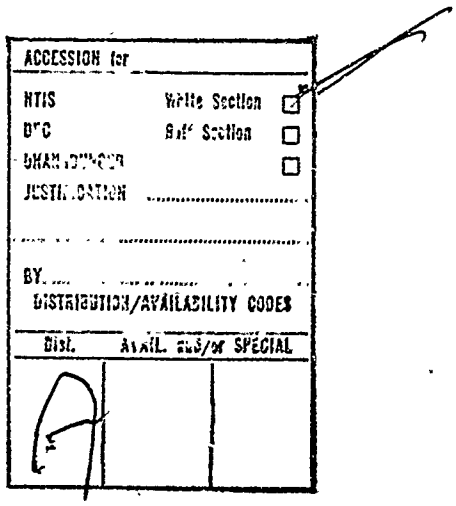

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PREFACE

The work described in this report was authorized under RDTE Task 1T762708DO4801, Preparation of Environmental Assessments. Collation of this data began in December 1973 and was completed in March 1975.

The data compiled in this report adhered to "Guidelines for the Preparation of Installation Environmental Assessments," guidelines which were incorporated in Chapter 2, Environmental Considerations in DA Actions, Change 1, dated 15 November 1974, to AR 200-1, Environmental Protection and Enhancement, dated 7 December 1973.

The use of trade names in this report does not constitute an official endorsement or approval of the use of such commercial hardware or software. This report may not be cited for purposes of advertisement.

Acknowledgments

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EDGEWOOD ARSENAL: AN INSTALLATION ENVIRONMENTAL ASSESSMENT*

I. INTRODUCTION.

An Installation Environmental Assessment (IEA) contains all of the data pertinent to the impact of an installation on the environment. "Impact" can be beneficial or detrimental. "Environment" includes the social and economic pressures on man as well as man's influence on the quality of the air and water and on wildlife.

Primarily, an IEA is a source document for use in preparing Environmental Impact Statements and Environmental Assessments required on projects performed at Government installations. Due to the diversity of activities performed at Aberdeen Proving Ground (APG), an IEA was prepared. Because of the nature of the work performed at Edgewood Arsenal, a separate IEA has been prepared for the Edgewood Arsenal portion of Aberdeen Proving Ground. This IEA extracts data from the APG IEA that is pertinent to Edgewood Arsenal and provides amplification in certain areas to augment its usefulness to Edgewood Arsenal personnel.

Because the operations of Edgewood Arsenal are widespread, this document deals with the entirety of Gunpowder Neck and associated island and peninsulas. The term "Edgewood Arsenal" refers to this area and not to the tenant activity Edgewood Arsenal unless the context indicates otherwise.

Complete citations for documents and materials referenced in the text may be found in Section VIII, Documents Utilized.

II. HARFORD COUNTY, MARYLAND: DESCRIPTION.

A. Location and Size.

Harford County is located near the head of the Chesapeake Bay in the Northeast Atlantic seaboard region. It is bounded to the north by the Commonwealth of Pennsylvania, to the northeast by the Susquehanna River, to the southeast by the Chesapeake Bay, and to the southwest by the Little Gunpowder Falls and the Gunpowder River (figure 1). The greatest north-south dimension of Harford County is approximately 33 miles and the greatest east-west dimension is about 28 miles.

The county seat, Bel Air, is located 25 miles northeast of Baltimore, 60 miles northeast of Washington, DC, 40 miles southwest of Wilmington, Delaware, and 75 miles southwest of Philadelphia, Pennsylvania. The largest city is Havre de Grace with a population of 11,700.

Harford County encompasses a land area of 448 square miles and the geographic center is 39°32′ N, 76°18′ W. In 1970, it supported a population of nearly 115,400. It is projected that in 1975 the population will be about 175,000.

B. Topography and Drainage.

Harford County is divided into two physiographic sections – the low-lying Coastal Plain Province adjacent to the Chesapeake Bay and, further inland, the higher Piedmont Province containing the low, rolling foothills of the Appalachian Mountains. The two areas are separated by a line of waterfalls known as the "Fall Line," which extends from the mouth of the Susquehanna River in a southwesterly direction (just north of Route 7) to near the mouth of the Little Gunpowder Falls. The range in elevation in the county is from sea level to 800 feet above mean sea level (MSL).

*This information was collated from existing data only; no attempt to acquire new data has been made.

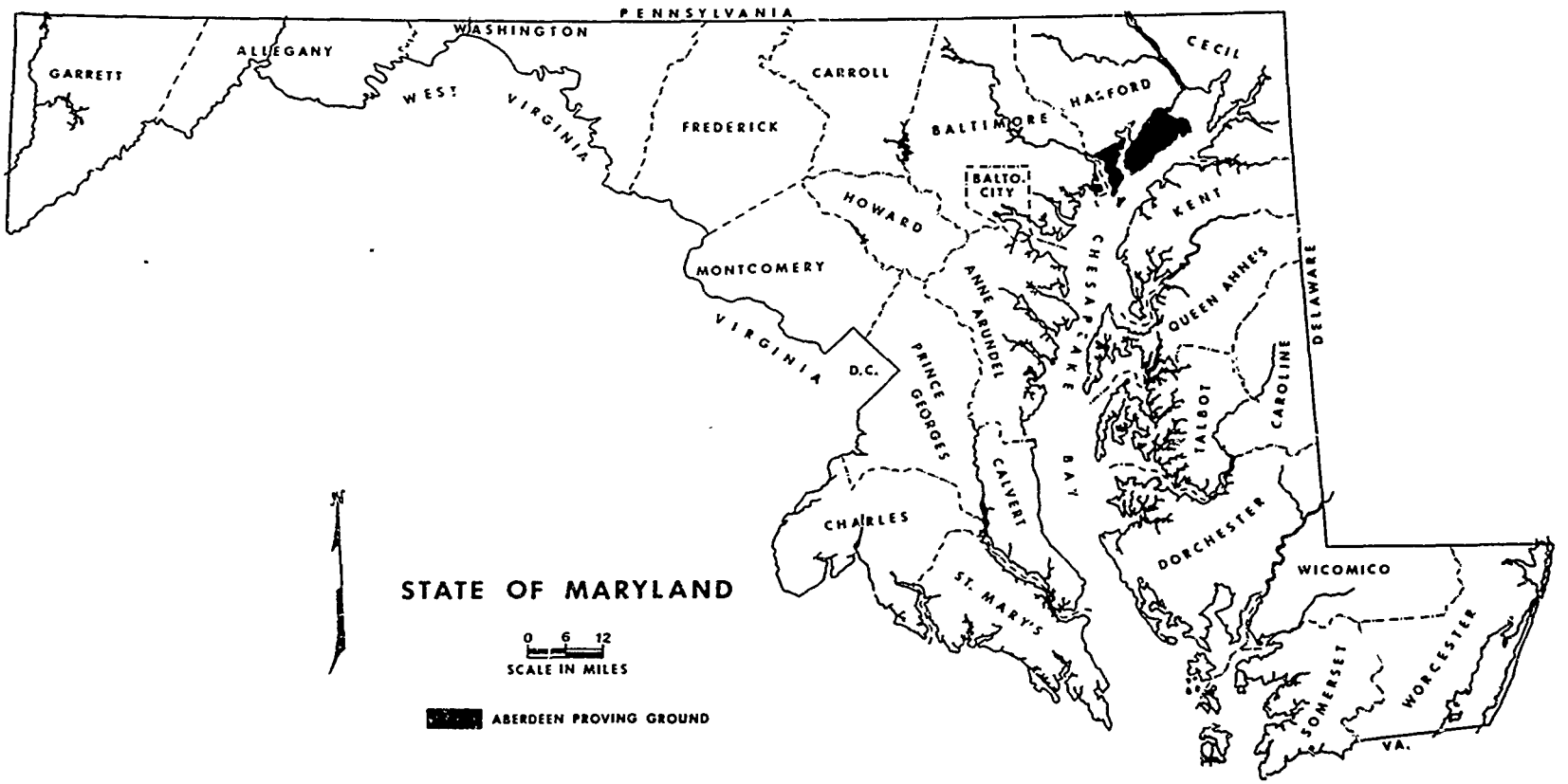


Figure 1. Location of Harford County and Aberdeen Proving Ground within the State of Maryland

Two small portions of Aberdeen Proving Ground (Carroll Island, Grace's Quarters, and the surrounding waters) are in Baltimore County just southwest of Harford County.

The northern third of the county is drained by Broad Creek and Deer Creek (figure 2) which empty into the Susquehanna River. The southern two-thirds of the county drains directly into the estuaries of the Bay. Several small creeks drain the southeastern corner; Winter's Run and the other branches of Bush River drain the south-central third, and the Little Gunpowder Falls (which empties into the Gunpowder River) drains the remaining southwestern corner of the county.

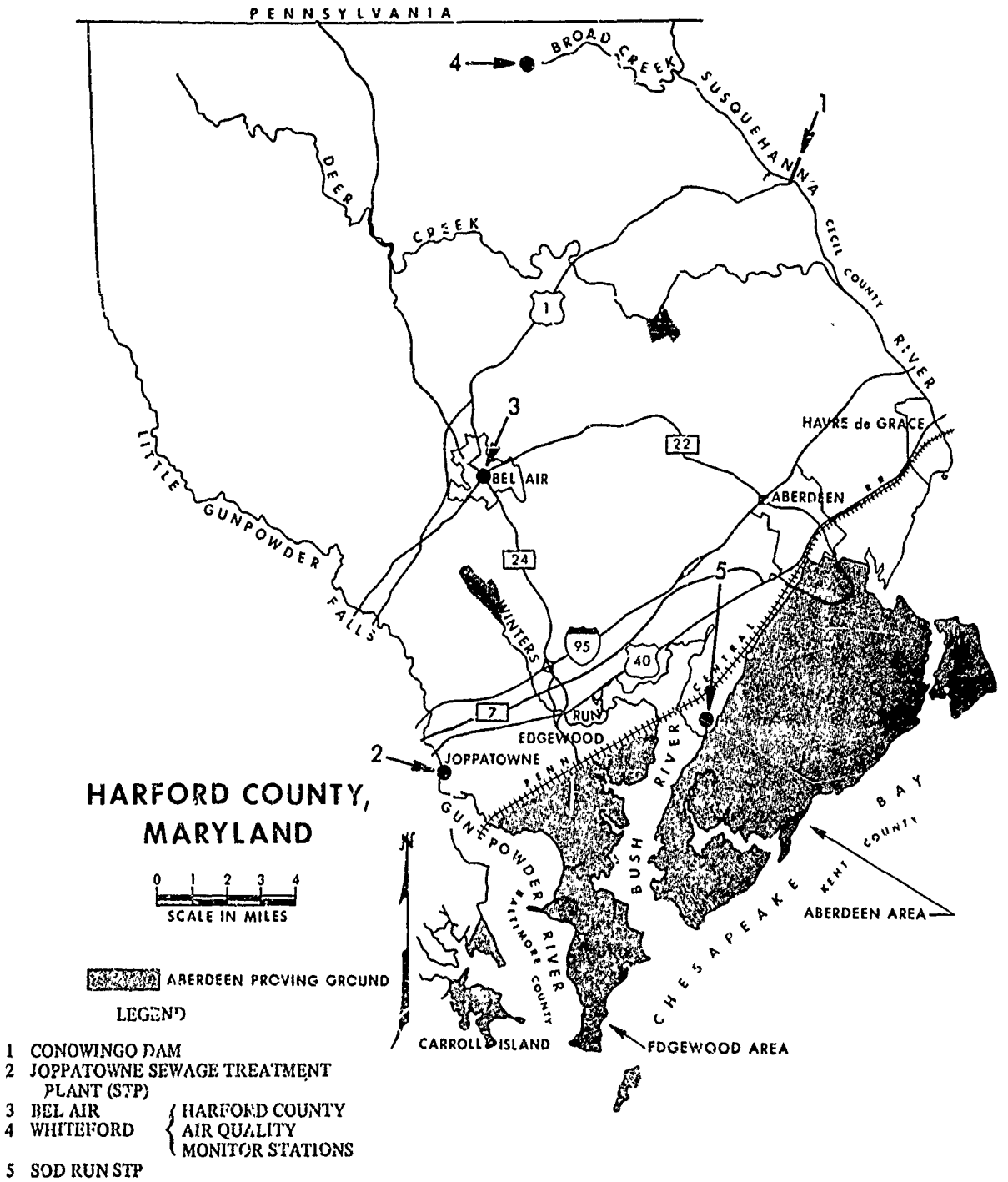


Figure 2. Features of Harford County

The major flood control facility is the Conowingo Dam on the Susquehanna River, approximately 20 miles northeast of Edgewood Arsenal.

C. Climate.

Harford County has a humid, continental climate. It is characteristically warm, temperate, and rainy without a dry season (low temperatures of winter are the major limiting factor for plants rather than drought). Because the area is sheltered by the Appalachian Mountains to the west and is close to the Atlantic Ocean to the east, winters are not as cold as those in other locations at the same latitude farther inland.

The county lies near the usual path of low-pressure systems that move through the area from the west, southwest, and south; these systems contribute to frequent changes in the weather and are responsible for much of the annual precipitation.

During summer months, the area is influenced by a large semipermanent high-pressure system centered over the Atlantic Ocean near 30° north latitude in the vicinity of Bermuda. The associated flow of warm, moist air from the south contributes to high temperatures and humidity and provides moisture for frequent afternoon and evening thunderstorms. In addition, the Chesapeake Bay causes humidity to be higher at all times of the year than it would otherwise be. Precipitation is rather uniformly distributed throughout the year, with the heaviest intensities usually in summer and early fall.

January is the coldest month, and July is the warmest. The highest average windspeeds occur during winter and spring. Summertime thunderstorms frequently occur in the area and windspeeds occasionally reach an intensity of 50 to 60 miles per hour. The probability of a tornado is small (one or two tornadoes may occur in the entire state during the year). The area may come under the influence of tropical storms or hurricanes about once a year during storm season which runs from June to October, with the greatest likelihood of occurrence in August or September. Snowfalls occur on an average of 25 days each year, with amounts in excess of 1 inch occurring 6 days each year. The heaviest snowfalls are in January, but accumulations may occur as late as March.

Table 1 presents a 9-year summary of climatological data for Edgewood Arsenal taken by the meteorological team stationed at Edgewood Arsenal.

D. Air Quality.

Harford County is located within the Metropolitan Baltimore Intrastate Air Quality Control Region of the Environmental Protection Agency (EPA) Region III.

According to Federal figures, Metropolitan Baltimore's ambient levels of five pollutants for which national standards have been established presently exceed the serious level. These pollutants and their reported levels are: particulates, the annual geometric mean is in excess of 95 μg/cu m and the 24-hour maximum is greater than 325 μg/cu m; sulfur oxides, the annual geometric mean exceeds 100 μg/cu m and the 24-hour maximum is greater than 455 μg/cu m; nitrogen dioxide, the annual geometric mean is equal to or exceeds 110 μg/cu m; carbon monoxide, the 1-hour maximum is equal to or exceeds 55 μg/cu m; and photochemical oxidants, the 1-hour maximum is equal to or exceeds 195 μg/cu m.

In short, air pollution is severe in this region. Although the above figures are representative of the Metropolitan Baltimore Intrastate Air Quality Control Region, the highest concentrations would be expected near Baltimore and lower concentrations would be expected in outlying areas. In fact, the data available for Harford County from the two air quality monitoring stations in Bel Air and Whiteford (figure 2) verify this assumption. The levels of particulates and the levels of carbon monoxide (carbon monoxide is measured only in Whiteford) were slightly below the primary standards (table 2). The actual levels in the vicinity of Edgewood Arsenal, then, are probably less than those discussed above.

Table 1. Monthly Summaries of Climatological Data for Edgewood Arsenal for a 9-Year Period[a]

Month	Average relative humidity	Average windspeed	Prevailing wind direction	Average monthly precipitation[b]	Average daily solar radiation	Average dew point	Average soil/snow surface temperature[c]	Average daily extreme inversion[d]	Average daily extreme lapse[d]	Record temperature extremes[e]	Mean daily temperature[f]
	%	mph		in.	Langleys/day	°F	°F	°F	°F	°F	°F
Jan	74	4	WNW	2.33	173	22	23.0-41.2	+9.1	-2.7	-8, 69	22, 39
Feb	71	4	WNW	2.74	244	22	24.3-44.7	+10.9	-3.1	-9, 63	24, 40
Mar	70	5	NW	3.27	342	30	30.9-59.4	+8.5	-3.6	7, 82	31, 51
Apr	69	5	S	3.34	390	38	38.0-71.8	+10.2	-3.8	21, 97	42, 61
May	71	4	SSW	3.14	481	50	50.5-94.4	+8.5	-4.1	30, 98	50, 71
Jun	75	3	SSW	3.00	537	61	60.1-108.3	+6.9	-4.2	35, 102	60, 81
Jul	75	3	SSW	4.27	527	64	65.0-113.4	+6.7	-4.3	52, 101	65, 83
Aug	77	3	S	4.19	451	64	61.8-107.2	+6.5	-4.7	47, 96	65, 83
Sep	77	3	NNE	3.44	375	58	54.2-95.1	+8.2	-4.4	39, 98	55, 76
Oct	75	3	SSW	2.08	283	46	41.6-75.8	+8.1	-3.3	23, 92	48, 68
Nov	72	4	NW	2.59	193	35	33.4-58.8	+9.9	-3.1	18, 79	36, 55
Dec	76	4	NNW	2.92	149	26	26.1-43.2	+9.3	-2.8	0, 70	27, 44

[a] Compiled from records from May 1959 to June 1968.
[b] All precipitation reduced to water equivalent.
[c] Soil/snow surface temperatures are ranges (average daily minimum-average daily maximum).
[d] Temperature gradients (inversion, lapse) measured between 0.5 and 4.0 meters.
[e] The extremes represent the highest and lowest temperatures for each month during the 9-year period.
[f] Temperature means are monthly averages of daily maximum and minimum temperatures for the 9-year period.

Table 2. Ambient Air Quality Standards[a]

Pollutant	Frequency, times values may be exceeded per unit time	More adverse range Lower limit	Upper limit	Lower limit	Upper limit	Serious level		Conversion factor
		μg/cu m		ppm		μg/cu m	ppm	
1. Sulfur oxides (expressed as sulfur dioxide concentrations)								
Annual arithmetic average[b]	Values not to be exceeded	39	79	0.015	0.03	79	0.03	$\frac{\mu g/cu\ m}{2620}$ = ppm
Daily average	Once per year	131	262	0.05	0.10	262	0.10	
One-year average	Once per month	262	525	0.10	0.20	525	0.20	
2. Particulate matter								
a. Suspended particulate								
Annual arithmetic average		65	75	-	-	75	-	
Daily average	Once per year	140	160	-	-	160	-	

Pollutant	Frequency, times values may be exceeded per unit time	More adverse range Lower limit	Upper limit	Serious level	Conversion factor
b. Dustfall		mg/sq cm/month		mg/sq cm/month	
Annual arithmetic average	Values not to be exceeded	0.35	0.50	0.50	$\frac{mg/sq\ cm}{.035}$ = ton/sq mi
Monthly average		0.70	1.00	1.0	
3. Carbon monoxide				mg/cu m ppm	
8-hour arithmetic average[c]	Once per year	No standard		10 9	mg/cu m X 0.873 = ppm
Hourly average	Once per year	No standard		40 35	
4. Non-methane hydrocarbons[d]				μg/cu m ppm carbon	$\frac{\mu g/cu\ m}{656}$ = ppm
3-hour average[e]	Once per year	No standard		160 0.24	
5. Photochemical oxidants				μg/cu m ppm ozone	
Hourly average	Once per year	No standard		160 0.08	$\frac{\mu g/cu\ m}{1960}$ = ppm
6. Nitrogen dioxide				μg/cu m ppm	
Annual arithmetic average	Values not to be exceeded	No standard		100 0.05	$\frac{\mu g/cu\ m}{1882}$ = ppm

[a] This table was extracted from 10.03.38 "Regulations Governing the Control of Air Pollution in the State of Maryland, Area III".

[b] Annual averages shall be for the calendar year for all pollutants.

[c] Nine parts per million applies in areas representing generalized atmospheric levels, 20 ppm applies in any other place where members of the public congregate for extended periods of time.

[d] The standards set forth in this regulation for hydrocarbons are not based upon the direct adverse effects of hydrocarbons but upon an empirical relationship, based upon ambient air quality measurements, between morning hydrocarbon concentrations and oxidant concentrations occurring later the same day. The hydrocarbon standard is designed primarily to achieve the standard for photochemical oxidants. In view of the lack of an exact quantitative relationship, the uncertainties in existing measurement techniques, and a lack of full identification of the photochemically reactive species of hydrocarbons occurring in the ambient air in the region, these levels should be considered as tentative pending further scientific developments.

[e] Three-hour period: 6 a.m. to 9 a.m. eastern standard time.

The Maryland State Bureau of Air Quality Control has a comprehensive Air Pollution Agency monitoring network; the results are published quarterly and annually.

E. Water Quality.

1. Ground Water.

The most important streams in proximity to Edgewood Arsenal are listed in table 3 along with their usage as stated in Maryland State Water Resources Regulation 4.8, General Water Quality Criteria and Specific Water Quality Standards for All Maryland Waters, amended 18 March 1968.

Table 3. Water Quality Criteria and Standards for Maryland Waters Near Edgewood Arsenal*

Area	Water	Zone	Water uses to be protected**
Edgewood	Winters Run	Source to US Route 40	II, III, IV (Trout), VI
	Winters Run	Atkisson Reservoir	II, III, IV
	Winters Run	US Route 40 to Otter Point Creek	III, IV, V, VI
	Nontidal tributaries of Bush River	Source to Bush River	III, IV, V, VI
	Bush River and all tidal tributaries		III, IV, VI
Aberdeen	Romney Creek	Source to Chesapeake Bay	VI
	Swan Creek and tributaries	Source to US Route 40	III, IV, V, VI
	Spesutie Narrows	Source to Chesapeake Bay	VI
	Chesapeake Bay	Baltimore County, Kent County, Cecil County, and Harford County	III, IV, VI
	Susquehanna River	Pennsylvania State line to Chesapeake Bay	II, III, IV, V, VI

*Maryland State Water Resources Regulation 4.8.

**Water use categories:

I - Shellfish harvesting
II - Public or municipal water supply
III - Water contact recreation
IV - Propagation of fish, other aquatic life, and wildlife
V - Agricultural water supply
VI - Industrial water supply

The subsurface water in the county is drawn from sediments of the Lower and Upper Cretaceous age and Pleistocene deposits, all of which underlie most of Harford County except for the northernmost margin. Unfortunately, these deposits contain some of the poorest aquifers within the area of Harford, Baltimore, Howard, and Cecil counties. The following summary characterizes these deposits more fully.

Pleistocene (Lowland Deposits). These are irregular beds of sand, gravel, and clay of continental origin whose thickness is from near zero to 175 feet. They generally yield an adequate water supply for shallow domestic wells. Heavy pumping could bring about salt-water contamination from adjacent estuaries.

Upper Cretaceous (Patapsco Formation). These are very permeable beds, yielding up to 900 gallons per minute (gpm). They may be high in iron content and contain some salt-water contamination.

Lower Cretaceous (Patuxent Formation). This formation, the most important one in the area, yields large supplies of water for industrial use. The combined Patapsco and Patuxent formations are from 475 to 750 feet thick.

The following table illustrates the quality of the water obtained from the three formations.

Table 4. Water Quality of Harford County Aquifers

Formation	Dissolved solids		Sodium carbonate hardness		Iron content		pH	
	Range	Average	Range	Average	Range	Average	Range	Average
	ppm		ppm		ppm			
Pleistocene	31-587	116	3-403	49.6	0-34	2.0	5.0-7.8	6.3
Patapsco	12-446	116	2-463	36.0	0-30	4.7	3.5-8.6	5.7
Patuxent	18-227	91	1-80	14.0	0-15	2.1	4.7-8.2	6.1

2. **Domestic and Industrial Supplies.**

Domestic and industrial water in Harford County is obtained from either municipal or privately-owned sources.

Bel Air, the county seat, is served by the Maryland Water Works Company which draws upon Winters Run at its point of intersection with US Route 1, a short distance southwest of the town. At this site the raw water is chlorinated and filtered and a sedimentation process is applied. The area served by this facility has a population of about 12,000 and uses an average of 950 thousand gallons of water per day. The plant capacity is 2.5 million gallons per day (gpd). The water of Winters Run is of fairly good quality. Data supplied by the company indicate that the hardness of the raw water is on the average 30 ppm $CaCO_3$; alkalinity is 28 to 30 ppm; and the pH is from 6.8 to 7.0. The turbidity is from 5 to 8 Jackson turbidity units. Treatment reduces this to 0.05 Jackson turbidity unit and raises the pH to a range of 7.5 to 8.0.

Havre de Grace has a municipally-owned water department whose source of supply is the Susquehanna River, which should serve the town's needs far into the foreseeable future.

Aberdeen also has a municipally-owned water system which obtains its supply from wells. Efforts are now underway to find additional wells as the population of the area is growing.

Joppa, with a population of about 10,000, depends on wells taken into receivership by a Philadelphia bank from the corporation that developed the area. Excessive manganese contamination of this water is causing concern.

The greater part of the rest of the county obtains its water from the Harford County Water and Sewers Division of Public Works, centered in Bel Air. The source of their water is six wells in Perryman; four of these are on Aberdeen Proving Ground and two are outside the reservation. The Water and Sewers Division is currently awaiting approval of a plan that would allow them to draw additional water from Deer Creek near its junction with the Susquehanna River. This additional supply would provide for an extension of their lines to the many new housing developments in the county.

There are no major industrial outfalls in the proximity of Aberdeen Proving Ground. Three sewage treatment plants exist in the county: The Joppatowne Utility Company plant, with a capacity for secondary treatment of 1 million gpd, is now operating near capacity; Harford County's Sod Run Plant, with a capacity of about 4 million gpd, is currently overtaxed in peak periods, and the City of Aberdeen's sewage treatment plant, the capacity of which is 1 million gpd with an average flow of 0.75 million gpd.

The Harford County Health Department is responsible for monitoring the water provided to the county by the Water and Sewers Division. Monitoring is carried out at 17 points located at the end of the distribution lines. The Harford County Health Department conducts monthly bacteriological testing and quarterly testing of the chemical properties of the water, that is, alkalinity, color, iron content, hardness, fluoride, pH, sodium, total solids, and turbidity. Samples are sent yearly to the State Laboratories for analysis of aluminum, calcium, magnesium, manganese, silica, sulfate, and bicarbonate content. Continuous monitoring is carried out at the well site where lime, chlorine, and fluoride are added to the raw water. Frequent bacterial testing is also done at this site.

3. Surface Waters.

The Upper Chesapeake Bay, a part of which adjoins Aberdeen Proving Ground, is an area of great biological importance. Recent studies by several groups, including Westinghouse Electric Corporation, the Academy of Natural Sciences of Philadelphia, and Johns Hopkins University, indicate that the Susquehanna River from the Conowingo Dam to its mouth is capable of supporting a variety of fish. A total of 20 species was caught on these surveys. It was found that heavy metals concentrations were relatively low and would not be toxic to aquatic life. With two or three exceptions, the total coliforms and *Escherichia coli* present would not preclude water contact sports. The organic pollution load received by the Susquehanna River from its tributaries seems to originate mainly from farms and homes.

Since this area of the Chesapeake Bay presently supports good and diverse fisheries and is used by many species as a spawning area, every effort must be made to preserve its natural condition.

Bush River is the first significant tributary on the western shore of the Chesapeake Bay south of the Susquehanna River. It is a wide, shallow estuary bordered on both sides by divisions of Aberdeen Proving Ground. There are few significant discharges into Bush River. The Sod Run Sewage Plant discharges into Romney Creek which empties into the bay on the opposite side of the peninsula from Bush River. Although there is little flow in the Bush River, oxygen values are relatively high.

Estuaries such as the one described are most important in the life cycles of many aquatic organisms. Anadromous fish of several species ascend the estuaries to spawn, and the embryos and larvae return downstream to low-salinity areas to feed on the abundant phytoplankton and zooplankton produced there.

Catadromous fish spawn at sea and the larvae migrate to the relatively fresh water of the estuaries where they grow and develop to maturity.

Since Bush River supports fishes in both of these categories, it must be regarded as an important resource. Not only does it serve as a nursery for food and game fishes, but for ecologically significant species as well, those that serve as food for the commercial fishes. Any diminution of the latter must adversely affect the former.

In a 1972 survey of Bush River fauna, 38 species of fish were recorded. Of these, 23 species were freshwater spawners, 2 species were freshwater or estuarine spawners, 7 species were estuarine spawners, and 6 species were marine spawners.

III. EDGEWOOD ARSENAL: DESCRIPTION.

A. Location and Size.

Edgewood Arsenal is located just south of the town of Edgewood, Maryland, approximately 21 miles northeast of Baltimore, just off US Route 40. As treated in this assessment, it occupies the entirety of Gunpowder Neck (11,500 acres), a peninsula 9 miles long in the Chesapeake Bay; Pooles Island, 1/2 mile off the southern tip; and two smaller peninsulas, Grace's Quarters (476 acres) and Carroll Island (855 acres), which are separated from the rest of Edgewood Arsenal by the Gunpowder River (the Baltimore-Harford county line). Gunpowder Neck lies in the southwest extremity of Harford County and the two smaller peninsulas lie in the southeast portion of Baltimore County (figure 2).

Land use and management control fall within the purview of Aberdeen Proving Ground. The distribution of land use is: improved ground, 1,242 acres; semi-improved ground, 1,244 acres; unimproved ground, 4,000 acres; and forest, 4,582 acres.

B. History.

1. Harford County.

Harford County was first explored by colonialists in 1608 when Captain John Smith and his men explored and mapped the upper Chesapeake Bay.

What is now Harford County was a part of Baltimore County until 1773 when a legislative act brought about the separation. The county was named for Henry Harford, a son of the sixth Lord Baltimore. Bel Air became the county seat in 1787.

"The times just prior to the American Revolution were rife with indignation over the treatment of the colonies by England. The people of Harford County were keenly aware of the dangers of relinquishing their rights and privileges to Britain, which consequently resulted in the election of a Committee of Harford County who on March 21, 1775, signed what became to be known as the 'Bush Resolution.' This resolution could be called the first Declaration of Independence signed by any representative in America."*

* Discover Harford County, Harford County Economic Development Commission.

2. Edgewood Arsenal.

Before it was acquired by the Army, Gunpowder Neck was predominately agricultural, with large wooded areas; the areas near Piney Point and Hog Point were wooded and residential. It had originally been part of a 17th-century British land grant to Thomas O'Daniel, who had brought a group of settlers there. In the mid-19th century, over half of the Gunpowder Neck was acquired by General George Cadwalader, who purchased a number of the smaller farms in the area. He created a mansion for himself at Maxwell Point and built duckblinds. Other waterfront tracts were purchased and developed by sporting interests as hunt clubs.

In the fall of 1917, after the entry of the United States into the First World War, the Federal Government acquired for military use, by condemnation, the whole of Gunpowder Neck, together with extensive tracts along Chesapeake Bay to the northeast. The northern portion of Gunpowder Neck was set aside as an assembly site for toxic gas munitions, and construction of plants for this purpose was begun by the Ordnance Department before the end of 1917. Additional plants for the production of war gases were erected in the following year. The site was activated as Edgewood Arsenal on 4 May 1918 and shortly thereafter transferred to the newly organized Chemical Warfare Service (CWS). When the war ended, the arsenal had three shell-filling plants, a chlorpicrin plant, a phosgene plant, a mustard plant, and a chlorine plant completed and functioning. A large number of auxiliary service installations, barracks, laboratories, railroad facilities, and utilities had also been constructed, along with a sizable and urgently needed hospital. Most of the construction was accomplished by civilian labor, upward of 8,000 workers, but plant operation was largely in the hands of the garrison, which reached a level of over 7,000 men.

After the armistice, most of the work at Edgewood Arsenal ended and the troops were discharged. But in the years immediately following, other CWS activities were brought in (gas mask lines, research groups, proving ground operations, the Chemical Warfare School), making the arsenal the only CWS field installation. A portion of the post (the present troop area) was turned over to the Field Artillery in 1922 and named Fort Hoyle; this area was reclaimed by the arsenal in 1940 during the pre-World War II buildup. This buildup began late in 1939 and involved both rehabilitation of existing facilities and construction of new ones, including an airstrip; it continued into the wartime years of the early 1940's.

During those years, Edgewood Arsenal remained the key CWS field post although new chemical arsenals were established elsewhere to meet wartime production programs. Toxic gas plants at Edgewood Arsenal produced phosgene and mustard in large quantities, along with pilot-scale nitrogen mustard. A wide variety of chemical munitions, along with incendiary weapons and smoke munitions, were turned out from filling lines. On the defensive side, Edgewood Arsenal produced gas masks and CC_2 impregnite for protecting uniforms. It also possessed one of the four chlorine plants operated by the CWS during World War II. In addition to its role as a war production center, Edgewood Arsenal was the home of a greatly expanded CWS research and development activity; it contained a depot and a proving ground; it trained large numbers of CWS officers, enlisted men, and units; and it was the center of the CWS inspection system. At wartime peak, over 7,000 soldiers and 10,000 civilian workers were assigned to the post.

After World War II, the greater part of the production facilities were shut down or leased to civilian contractors. Edgewood Arsenal, however, continued to be the center of an active Chemical Corps research and development program. The Chemical Corps School was moved to Fort McClellan during the Korean war, and the proving ground was closed before the activation of a new and larger facility at Dugway. There was an increase in the level of manufacturing for a short time during the Korean war, and some industrial activity, generally of pilot-plant scale, continued thereafter; Chemical Corps procurement and engineering activities remained centered at Edgewood. After the abolition of Chemical Corps Headquarters in 1962, the arsenal became responsible for

overseeing the programs of the other chemical arsenals, a function which continued for a decade. During the Vietnamese war, it was designated the Army's Chemical Commodity Center.

In 1971, Edgewood Arsenal was merged with Aberdeen Proving Ground, resulting in the most diversified military installation in the nation, occupying more than 82,000 acres. The arsenal continues to function separately as a tenant activity of the enlarged Aberdeen Proving Ground.

C. Mission and Organization of Edgewood Arsenal.

1. Mission. The mission of the Commander, Edgewood Arsenal, a subordinate command of the US Army Armament Command, is to:

a. Operate as a commodity center for:

(1) Chemical agents and munitions including flame and incendiary systems, smoke generators, burning smoke-type pyrotechnic items, and smoke grenades, pots, and canisters.

(a) In the case of artillery and mortar ammunition, responsibility is limited to agent/filler (chemical, smoke, flame, and incendiary), filling process, agent compatibility, and dissemination characteristics of chemical artillery and mortar ammunition.

(b) Edgewood Arsenal is responsible for investigation of projectile closing designs and submission of recommendations to Picatinny Arsenal for the closure to be specified in technical data packages and the technical review and concurrence inclosures which are designed by Picatinny Arsenal.

(c) In the case of artillery and mortar ammunition, where development or product improvement of the agent/filler, filling process, agent compatibility, and dissemination characteristics of the chemical artillery or mortar ammunition do not affect the configuration or characteristics of the existing carrier, Edgewood Arsenal will be assigned as the prime responsible agency. All actions pursuant thereto will be coordinated with Picatinny Arsenal to assure that the artillery or mortar ammunition system has not been compromised. At the completion of the development or product improvement, the complete technical data package responsibility will remain with Picatinny Arsenal, with Edgewood Arsenal in support for the elements cited above.

(2) Chemical and biological protective equipment and systems.

(3) Related test and handling equipment.

b. Conduct research with respect to assigned commodities including specialization in:

(1) Chemical agent synthesis, analysis, and processes.

(2) Toxic chemical agent medical prophylaxis and therapy.

(3) Gas and aerosol cloud meteorology and micrometeorology.

(4) Flame and incendiary composition/weapon fuel technology.

(5) Chemical agent corrosion protection.

(6) Wound ballistics.

(7) Chemical agent degradation and materiel.

c. Perform design and development, product, process, and maintenance engineering, and related quality assurance for assigned commodities.

d. Perform national procurement for assigned commodities.

e. Perform national industrial mobilization planning for assigned procurement items.

f. Perform inhouse fabrication of prototypes, preproduction evaluation quantities, and emergency production of limited quantities of assigned critical items to fill in supply gap until industry can meet the needs.

g. Perform cataloging, standardization, new equipment training, design of pertinent training devices, and technical assistance to users, for assigned commodities.

h. Perform material systems analysis on materiel pertaining to chemical operations, including chemical and biological protective equipment and defense against enemy chemical weapons, except those analyses specifically assigned to other agencies.

i. Prepare RDTE program proposals, budget estimates, and funding requests for those chemical items that meet joint requirements of the Army and either the Navy or the Air Force, or both, and for all chemical agents required within the Department of Defense and provide support to Air Force, Navy, civil defense, and other governmental agencies.

j. Provide technical escort for the transfer and shipment of Department of the Army radiological material, all Department of Defense chemical agents, and assigned chemical munitions and other hazardous items in accordance with technical standards prescribed by the Secretary of Agriculture and the Surgeon General of the US Public Health Service. Perform explosive ordnance disposal procedures on items escorted when required to preclude an unacceptable dissemination of hazardous material.

k. Control the disposal of radioactive material within the Department of the Army.

l. Act as the Department of the Army Licensee and control the use, storage, and disposal of radioactive sources as prescribed in AR 700-63.

m. Develop program guidance on medical research jointly with the Army Medical Service for defensive aspects of chemical weapons and in implementing and evaluating technical aspects of the program.

n. Provide management for (1) all radioactive test samples and calibration sources except those uniquely associated with US Army Electronics Command tactical equipment, (2) radioactive training sources, and (3) precise radioactive meteorology sources.

o. Perform engineering investigations and studies with respect to suppressive shielding and its applications for containment and protection against hazardous effects of ARMCOM materiel as assigned. Perform studies with respect to hazardous and safety aspects of assigned commodities.

2. Organization.

The components of Edgewood Arsenal are shown in figure 3. The responsibilities of each are outlined in SAREA Regulation 10-1, dated 1 June 1974.

3. Capital Improvements.

Major planned improvements at Edgewood Arsenal include a research-animal isolation facility costing $7,630,000 (figure 4) scheduled for completion in FY 1976. A Toxicology Research facility (figure 4) costing $9,900,000 is scheduled for FY 1977, and an agent central defense laboratory costing $3,000,000 is scheduled for FY 1980 (figure 4). A demilitarization/disposal complex for demilitarization of bulk mustard (figure 4) is scheduled to be completed in 3Q FY 1978 at an estimated cost of 18,000,000 FY 74 dollars. The operating time is estimated to be 16 months and the operating cost is expected to be 18,000,000 FY 74 dollars.

D. Topography and Drainage.

Edgewood Arsenal consists mostly of flat and low-lying land. The maximum elevation is 50 feet above mean sea level. The lowness of the land is reflected in the fact that much of Edgewood Arsenal lies below the standard flood plain elevation (figure 5) which has been established by the Corps of Engineers to be that land which lies below the 8-foot (± 0.5 ft) contour line. The worst flood in recent history followed Hurricane Agnes in June 1972, when peak tide levels were between 6 and 7 feet above mean sea level.

There are 10 major drainage systems on Edgewood Arsenal (table 5, figure 6); all are slow-flowing streams the lower reaches of which are affected by the tides. Lauderick Creek, Canal Creek, and Grace's Quarters drainage systems extend outside the boundaries of the military reservation. The other systems lie entirely within the arsenal. Figure 7 presents all of the streams and water features on the arsenal.

E. Air Quality.

The air quality monitoring program at Edgewood Arsenal is being conducted by the Edgewood Arsenal Safety Office. The sampling sites are shown in figure 8.

Since July 1967, Edgewood Arsenal has conducted an air monitoring program in accordance with paragraph 1-6c of AR 11-21. This program samples for suspended and settleable particulates, sulfur dioxide, radionuclides, and toxic chemical agents at a total of 11 sites. The results indicate that all emissions generated by Edgewood Arsenal activities were below applicable standards.

The Safety Office of Edgewood Arsenal is currently conducting an air monitoring program for G and V agents according to the requirements set forth by the Army Office of the Surgeon General. The six sites sampled are identified in figure 8. The technique being used was developed at Edgewood Arsenal and involves the use of beaded-glass bubblers under refrigeration and analysis utilizing enzyme inhibition. Samples are taken once every 2 weeks over a 24-hour period. To date, the program has not found any concentrations above the detection limit of the technique.

Edgewood Arsenal is negotiating a clean air compliance agreement with the State of Maryland. These negotiations will impact upon Edgewood Arsenal and will require the use of incinerators rather than the open burning operations.

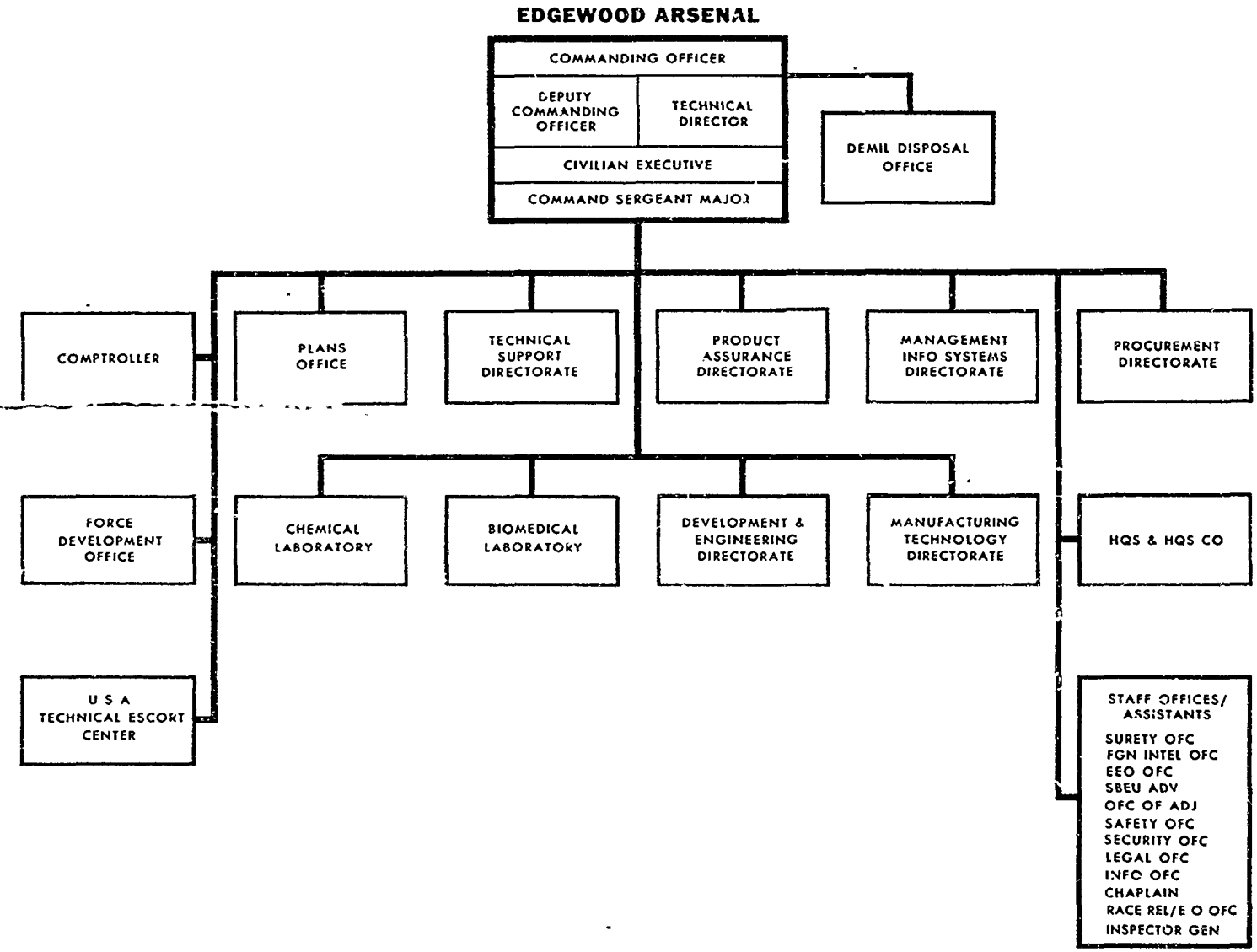


Figure 3. Organizational Chart of Edgewood Arsenal

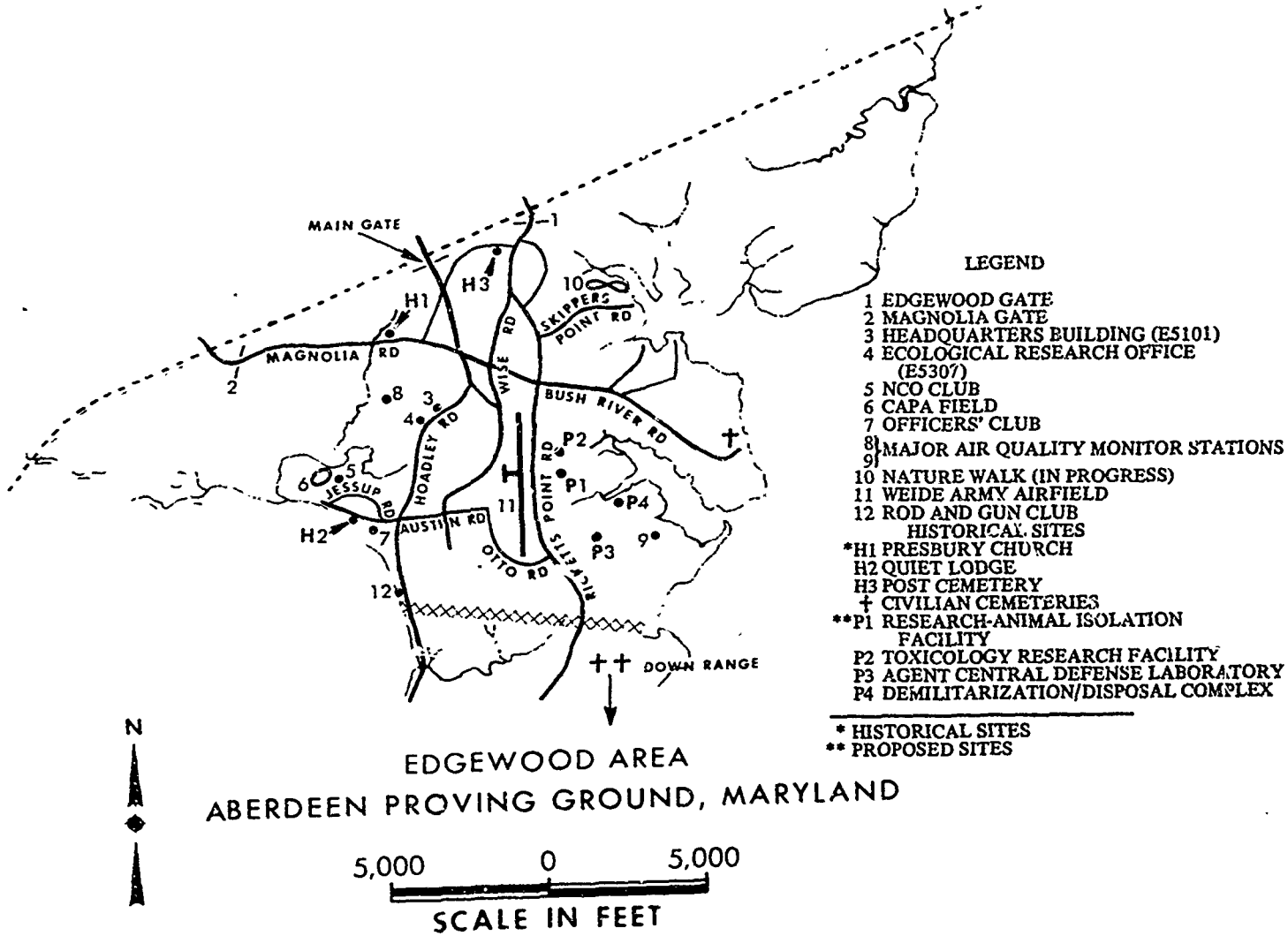


Figure 4. Features of Edgewood Arsenal

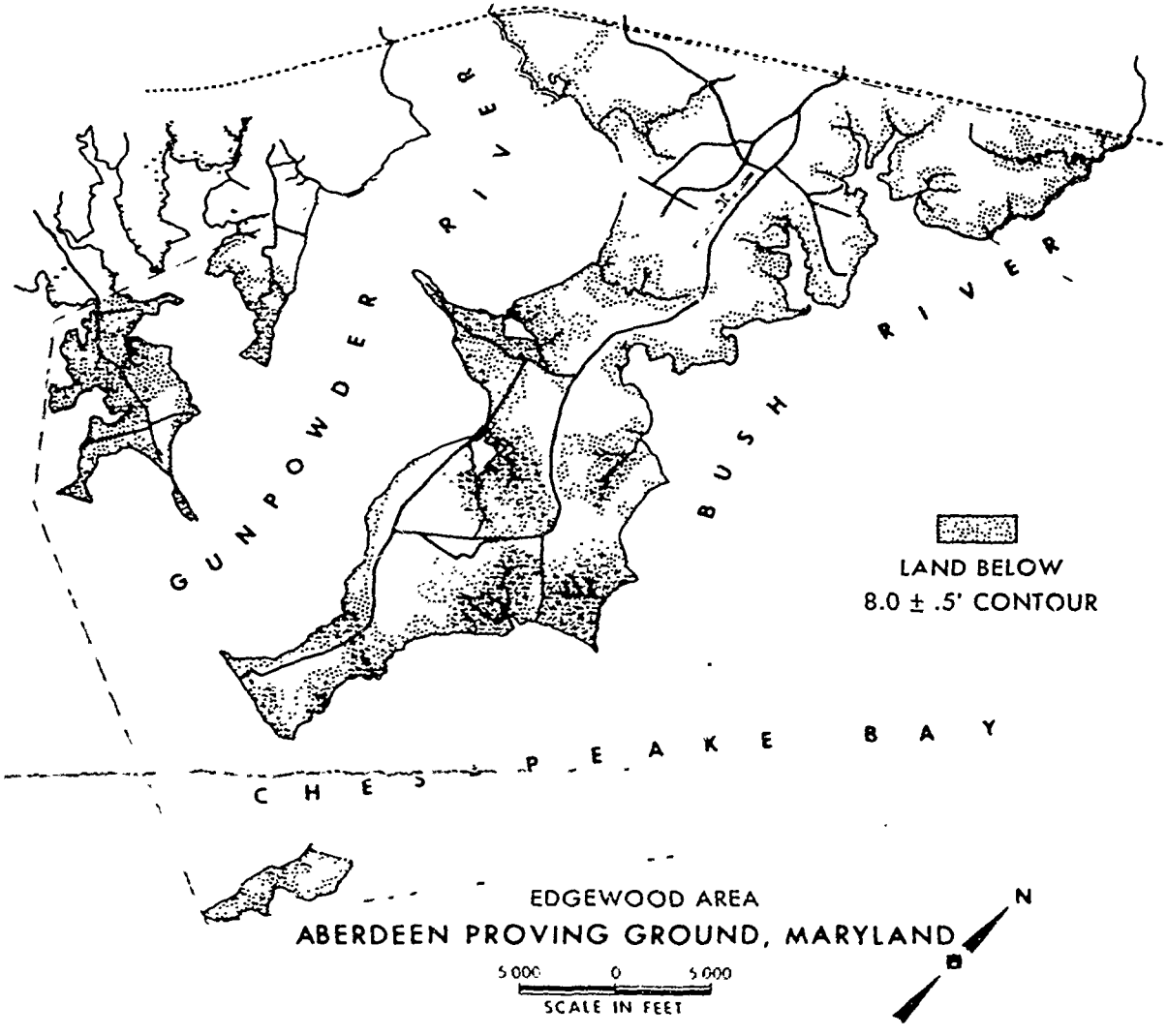


Figure 5. Corps of Engineers Standard Flood Plain Level
(8-Foot Contour Above Mean Sea Level)

Table 5. Drainage Systems for Edgewood Arsenal

Drainage system	Lies wholly within Edgewood Arsenal	Size
		acres
Canal Creek		3,250
Watson Creek	X	2,180
Lauderick Creek		2,100
Dove's Cove (Cooper's Creek)	X	1,260
Boone Creek	X	1,210
Carroll Island	X	880
Kings Creek	X	800
Swaderick Creek	X	630
Grace's Quarters		470
Pooles Island	X	400

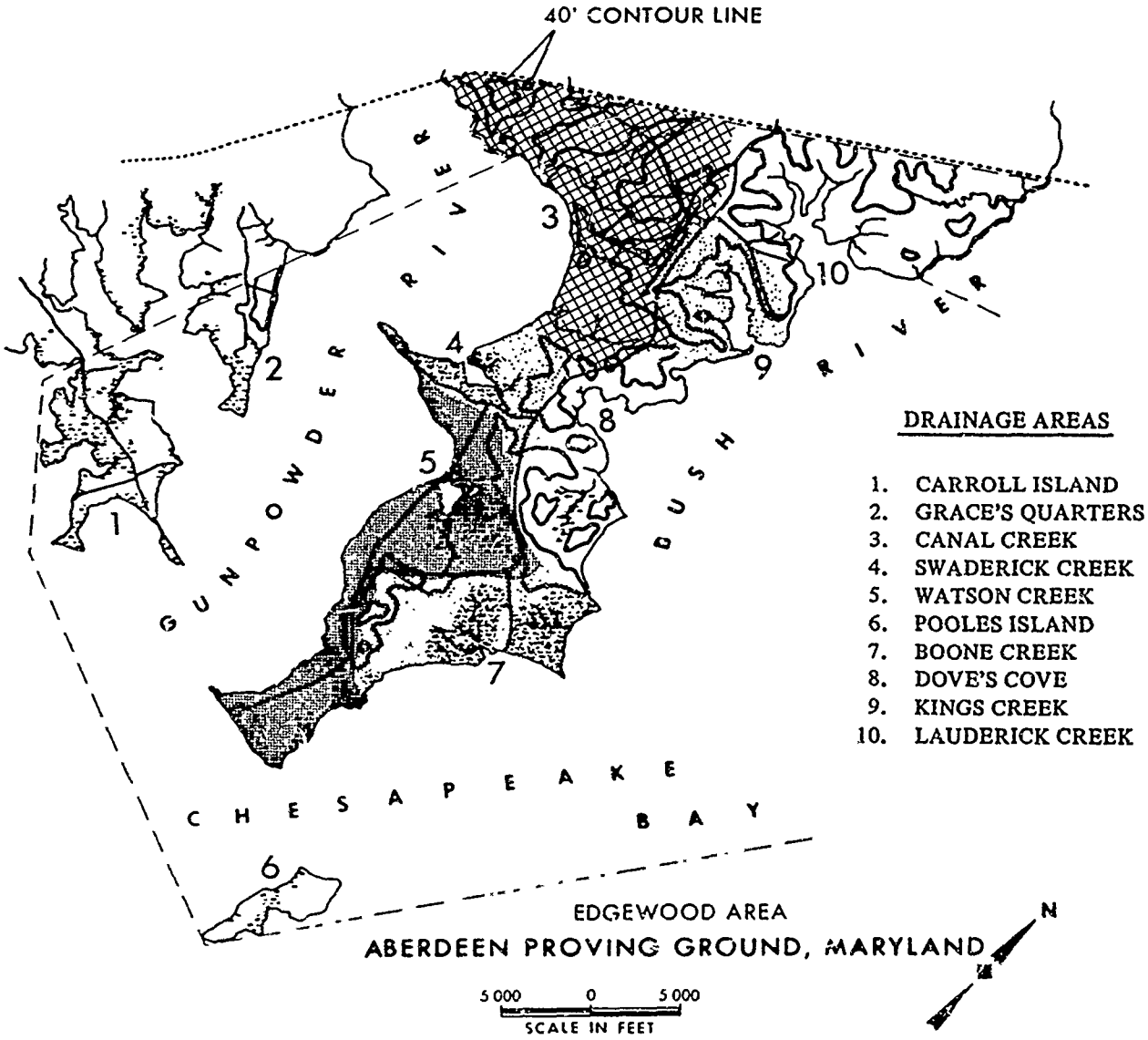
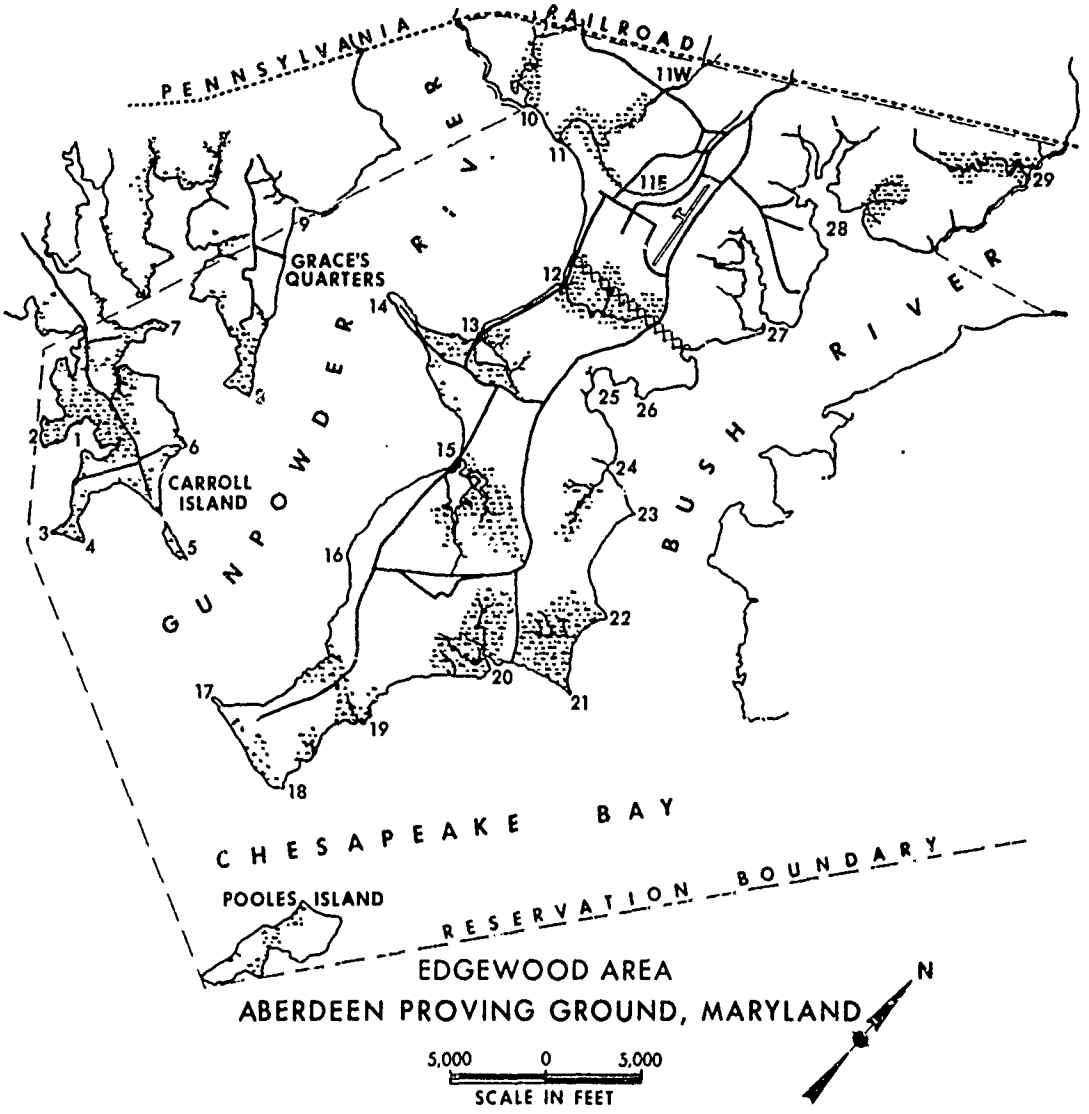


Figure 6. Topographic Map with Drainage Areas



Legend

1	Hawthorn Cove	16	Days Point
2	Brier Point	17	Rickett Point
3	Lower Island Point	18	Robbins Point
4	Weir Point	19	Fords Point
5	Carroll Point	20	Boone Creek
6	White Oak Point	21	Leges Point
7	Bengies Point	22	Sandy Point
8	Battery Point	23	Briery Point
9	Cunninghill Cove	24	Cooper's Creek
10	Reardon Inlet	25	Dove's Cove
11	Canal Creek (East and West Branches)	26	Wilson Point
12	Wright Creek	27	Beach Point – Kings Creek
13	Swaderick Creek	28	Lauderick Creek
14	Maxwell Point	29	Monks Creek
15	Watson Creek		

Figure 7. Streams and Water Features

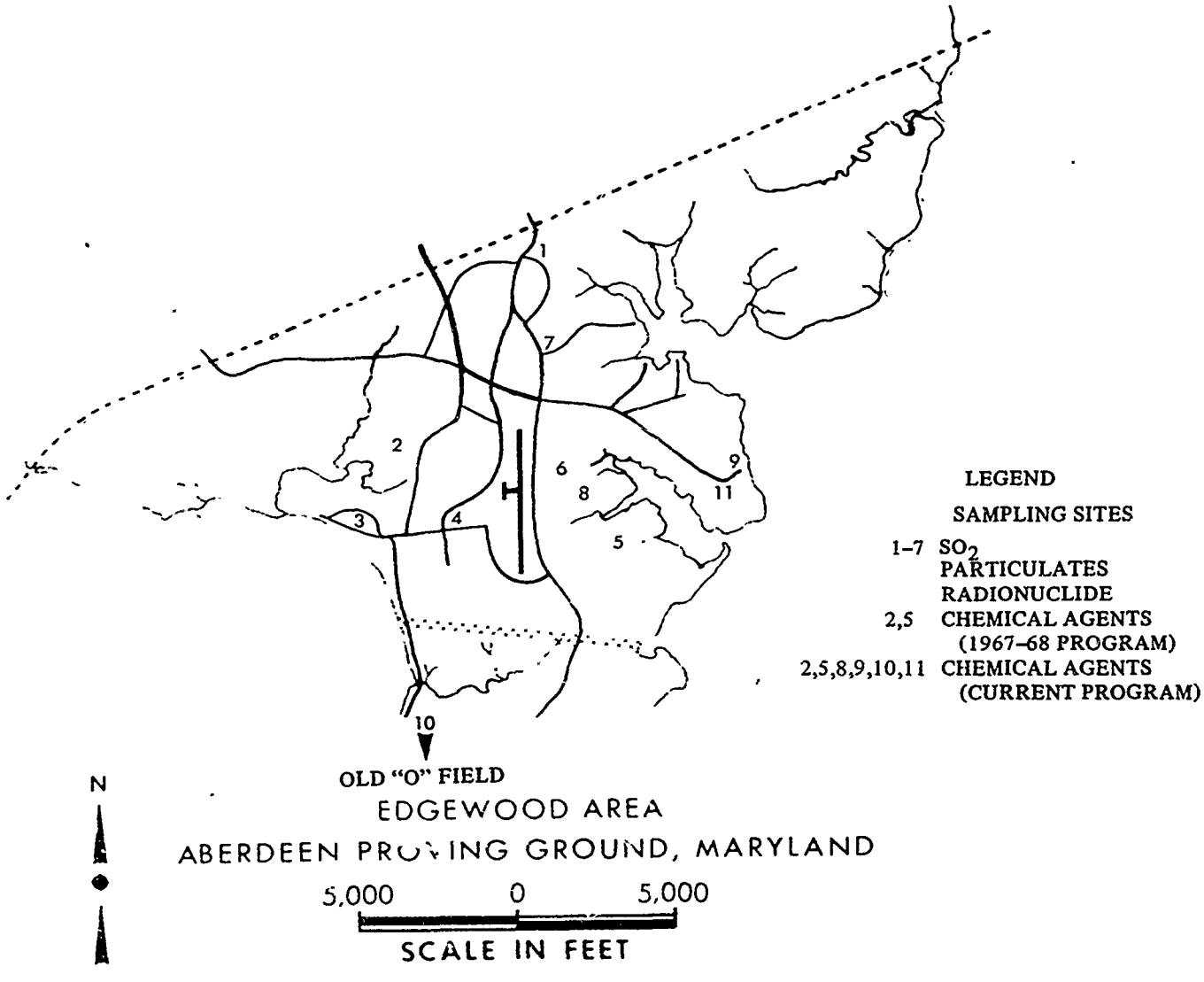


Figure 8. Air Quality Sampling Stations

Edgewood Arsenal operates three pathological incinerators. The newest unit, made by Environmental Control Products, Inc., meets all Maryland requirements. Negotiations are underway to allow an older, undersized Silent Glow Model CT-4 incinerator to be used as an emergency standby unit. The third unit (located in building 2338) is used for decontaminated laboratory waste. The effluent gas from this incinerator was monitored to insure that State of Maryland requirements are being met (see section V, D, 2).

The Technical Escort Center of Edgewood Arsenal transports and burns or detonates hazardous materials in the open where there is no other safe method of disposal (see section V, D, 3).

The Edgewood Arsenal demilitarization/detoxification unit is still in the preliminary planning stages. It will handle contaminated waste and will provide a practical alternative to the open burning of hazardous and explosive materials. To insure that the new toxic laboratory meets all requirements, Edgewood Arsenal is submitting a $500K project to update the hood filters.

Aberdeen Proving Ground is responsible for power and steam plant operations located in the Edgewood area. Edgewood Arsenal is not responsible for emissions or associated limitations from those operations (see the APG IEA).

F. Water Quality.

Edgewood Arsenal has had a monitoring program for its own activities since 1966. Although initially a small part of a larger program to determine the arsenal's total impact on the environs, the program has now expanded from 7 stations in 1966 to 68 stations, each measuring approximately 30 different parameters.

All 20 surface water stations are sampled, on the average, every other month, whereas the more sensitive locations are sampled monthly (sample sites may be located by referring to figure 9). Sampling is at random with respect to the day of the week but is accomplished at low tide when possible.

On-site analyses include temperature (except sewage plant), pH, dissolved oxygen, color, and turbidity. A 1-gallon grab sample is analyzed in the laboratory for H-agent and anticholinesterase activity.

Data for the most recent period, 1 October 1972 to 30 September 1973. have been analyzed. Only a few unusual sample results occurred, and most of these were the result of natural phenomena. There were no significant above-standard results for color, temperature, chlorides, phosphate, or dissolved oxygen. Violations of pH standards not attributable to seawater intrusion were observed at the following three sites:

Site 7 (figure 9) – due to heating plant effluent (a work order to correct the problem was submitted);

Site 12 – due to accidental overflow at a new coating process operation at E3516 (the operation procedure was modified to prevent a recurrence); and

Site 5 – due to run-off from a highway construction site.

In every instance, tests for mustard and anticholinesterase agents were negative.

In addition, arsenic was reported in "trace" amounts at every station including samples of the Bush River and the Gunpowder River. These findings are attributed to pesticide run-off from nearby farmland and are considered insignificant with respect to arsenal operations.

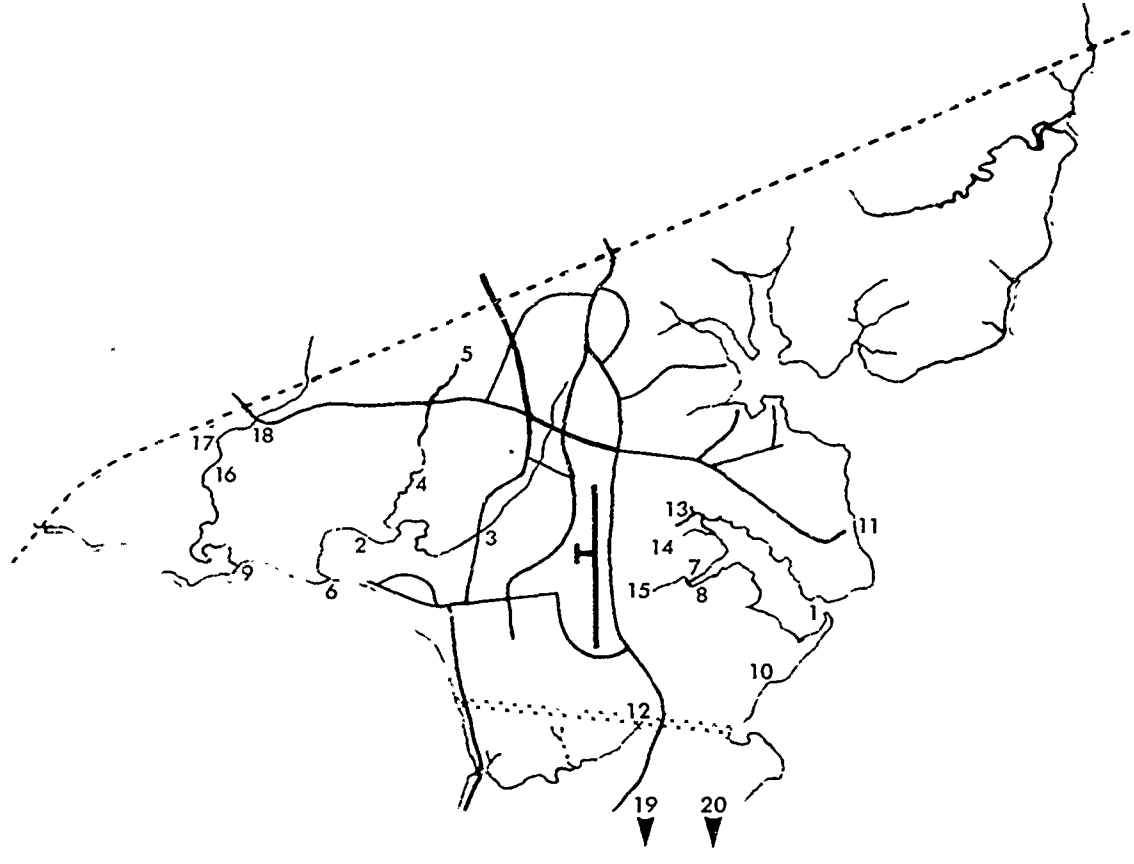


Figure 9. Water Quality Sampling Sites

Cyanide was reported at Site 7 twice during the sampling period. The levels were 0.04 and 0.02 mg/ℓ as compared with the US Public Health Service (USPHS) standard of 0.01 mg/ℓ and a USPHS rejection limit of 0.2 mg/ℓ for drinking water. Positive reports were intermittent and discharge had ceased by the time of subsequent sampling, which prevented identification of the source. Although there appears to be no large-scale water-pollution problem at Edgewood Arsenal, the reports of cyanide in Kings Creek are significant and special efforts are being extended to identify the source and to correct the problem.

Edgewood Arsenal has applied for 16 National Pollution Discharge Elimination System (NPDES) permits. A total of 48 outfalls have been investigated and statistically characterized. A number of engineering recommendations were made: (1) connecting drains to the sanitary sewer system where possible, (2) combining drains into area networks, and (3) applying for 18 additional NPDES permits. Thus far, the Environmental Protection Agency has not issued any of these requested permits.

Polluted liquids from various bench-scale projects, pilot plants, and shops are treated in a variety of ways and then discharged into several Class I and II waters. Treatment to date includes one solvent recovery still and a number of pH adjustment processes. In one pH adjustment technique, highly caustic decontamination wastes are titrated by acid addition prior to dumping into the sanitary sewer system; in another, industrial wastes are trickled through limestone beds prior to their release into the environment.

Although these effluent treatments have helped Edgewood Arsenal meet the current Maryland State standards for pH, current equipment is not effective for removing other pollutants such as heavy metals and organics from water. The effluent impurity concentrations are above the Environmental Protection Agency limits about 15% of the time. Based upon these data, Army Materiel Command has approved a $200K project to develop the necessary water treatment technology.

An installation-wide surface water quality monitoring program is under development by the APG Facilities Engineering Directorate and approval for its implementation has been requested. The program will include six water quality surveillance stations in the Edgewood area to monitor creeks and effluent from sewage treatment plants for potential pollutants, including industrial as well as domestic wastes, so that a record of compliance with State and local water quality standards can be compiled. Each water quality surveillance station will monitor the parameters shown in table 6. The parameters marked with an asterisk require continuous automatic analysis and recording; those marked with a (G) will be analyzed on a random grab sample basis; those marked with an (S) will be analyzed by spot measurements; and the remaining parameters will be analyzed from composite samples or sequential discrete samples obtained from an automatic sampler. An alarm system will provide an audio and visual warning when the automatically analyzed parameters (pH, conductivity, and residual chlorine) exceed acceptable limits.

The current monitoring system appears adequate; however, 24-hour composite samples in lieu of grab samples would provide more representative values. Some of the sampling sites (e.g., at Beach Point and at the Sewage Treatment Plant) should be relocated to provide increased monitoring of Edgewood's mission-related effluents. The Edgewood Arsenal Safety Office is aware of these shortcomings and is designing procedures to modernize the water quality surveillance stations program.

IV. EDGEWOOD ARSENAL: NATURAL RESOURCES.

A. Flora and Fauna.

The number of species of plants and animals found on the installation is large as can be seen from the species lists in appendix A. These lists* were compiled from numerous sources, including unpublished data, by the Ecological Research Office, Biomedical Laboratory, Edgewood Arsenal.

* The lists were prepared for the whole of Aberdeen Proving Ground because the land areas are joined and it is not meaningful to segregate biological data of this type.

Table 6. Parameters to be Monitored by Water Quality Surveillance Stations at Edgewood Arsenal

Location		Monitored parameters														
Station number	Description	Dissolved oxygen and temperature (S)	Chemical oxygen demand≠	Chloride≠	Fluoride≠	Sulfide (sulfates)≠	Orthophosphate≠	Coliform (G)	pH*	Suspended solids (G)	Stream height*	Residual chlorine*	Nitrate/nitrite≠	Conductivity*	Arsenic≠
1	Main-Sewage Treatment Plant (STP)	X						X	X	X					
2	Mouth - Kings Creek	X	X	X	X	X	X		X	X	X		X	X	
3	Lauderick Creek - STP	X						X	X	X	X	X			
4	STP near Building E2188	X						X	X	X		X			
5	Mouth - Canal Creek	X	X	X	X	X			X	X	X		X	X	X
6	STP near Building E7930 (Carroll Island)	X						X	X	X	X	X			

* Indicates continuous analysis and recording of these parameters.
≠ Indicates composite and/or sequential discrete samples over a 24-hour period are required.
(G) Indicates a grab sample collection.
(S) Indicates spot measurements.

There are 30 species of mammals reported on Aberdeen Proving Ground, five of which are abundant (easily encountered by the serious observer). There are 190 species of birds reported, 12 of which are abundant; 22 species of reptiles are reported, seven of which are abundant; 15 species of amphibians are present, seven of which are abundant; and there are 52 species of fishes, 11 of which are abundant.

There are 106 species of invertebrates recorded but the data available on this taxon are very limited; therefore, this list is far from complete.

The list of 21 species of algae reported is considered incomplete; also, data on their abundance are not available. No lists of fungi, mosses, lichens, and ferns have been located, and only sparse data on herbaceous plants are available, 22 species having been reported. (The Ecological Research Office, Edgewood Arsenal, expects to fill these data gaps with interim reports.) The woody plants are fairly well documented; 95 species have been reported, 23 of which are considered to be abundant.

The installation lies on the Atlantic flyway and because it offers large areas of water and wetland, migratory water fowl are abundant and are a valued aesthetic and recreational resource. The whistling swan which overwinters on some of Aberdeen Proving Ground's waters is being studied extensively here and elsewhere on the Chesapeake Bay by a team from Johns Hopkins University. The estuarine waters of Aberdeen Proving Ground provide a major mating ground for the blue crab and major spawning areas for striped bass, white perch, yellow perch, herring, and shad.

The Maryland darter, which appears on the Federal Endangered Species List, is found solely in a few creeks in southeastern Harford County. One of its few remaining habitats is Swan Creek which borders Aberdeen Proving Ground to the northeast. The possible occurrence of this extremely rare fish on Aberdeen Proving Ground should be investigated. There is an unconfirmed report that the bog turtle (listed as endangered by the State of Maryland) has been found in the Aberdeen Area of Aberdeen Proving Ground.

Three wildlife kills, all involving fish, have been reported in the recent years. One occurred in waters off the Aberdeen Area of Aberdeen Proving Ground but the cause was not determined. The other two were investigated by a team headed by personnel from the Ecological Research Office, Edgewood Arsenal, and in both instances the causes were identified. The first involved large numbers of fish killed near Maxwell Point on 2 May 1970. Talc used as a simulant in testing disposal systems for riot control agents covered a large area of the waters on the south side of Maxwell Point. The particles of fine powder were suspended by wind and wave action and clogged the fishes' gills causing suffocation. The number of fishes killed was estimated at 5,000 to 7,000; they were mainly white perch. Such tests have been terminated.

The second incident occurred on 26 August 1971 when about 90 to 100 dead carp were found along 100 yards of shore west of White Oak Point on Carroll Island. A live-box (a large wooden box in which commercial fishermen keep live fish) was located on the shore in the area of the carp kill. Because of the lack of any physical abnormalities in the water at White Oak Point, the extreme localization and specificity of the kill, and interviews with local commercial fishermen, it was concluded that the carp probably died when the live-box was washed ashore and that they probably were distributed over the area when the rising tide washed them from the open box.

B. Habitats.

The entirety of Gunpowder Neck has a history of use which disturbs the natural setting. Before Army occupation, the area was used for agriculture; now, large areas are burned annually and even larger areas are subjected to impacting weapons fire (see section V, H). In spite of these seemingly severe actions, much of Edgewood Arsenal has suffered considerably less disturbance than surrounding areas. Indeed, although no area of the installation other than the marshes can be considered virgin, many of the woodlands are in advanced stages of succession.

Figure 10 depicts the distribution of the four major habitat types found at Edgewood Arsenal: cleared areas or meadows, woodlands, tidal marshes, and swamps. The State of Maryland has enacted a "Wetlands Act", sections 718 through 731, inclusive, of Article 66C of the Annotated Code of Maryland which provides for the communal protection of the state's remaining wetland habitat. The wetlands protected are roughly equivalent to the tidal marshes identified in figure 10. In brief, the Wetlands Act requires that any development, modification, or impact on the wetlands must be coordinated with the state.* With the increased pressure for shorefront property in recent years, many of the surrounding private wetlands were filled in before enactment of this protective legislation. Consequently, the wetlands of Edgewood Arsenal represent a substantial proportion of the undisturbed wetlands remaining in the Upper Chesapeake Bay.

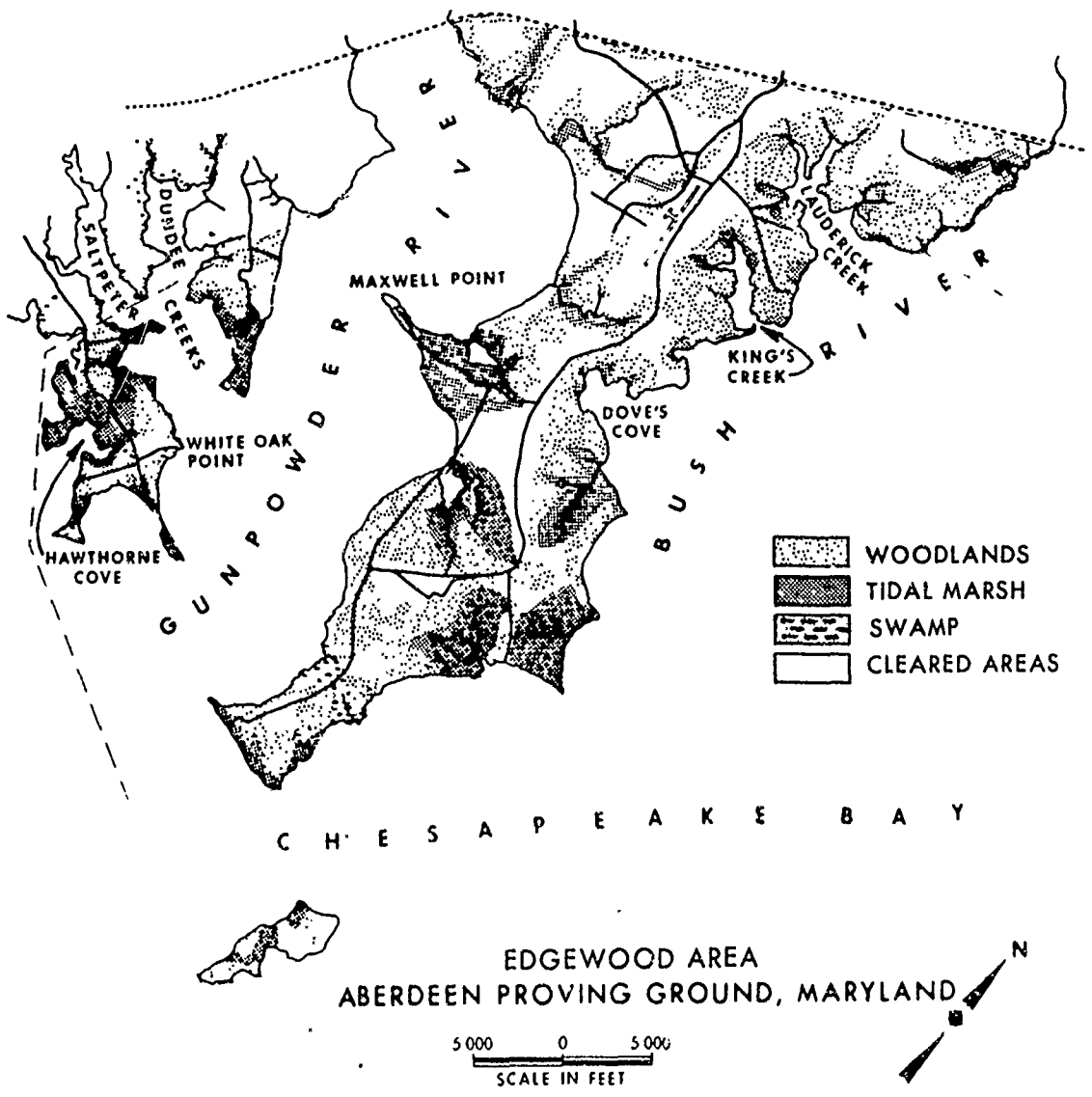


Figure 10. Faunal Habitats

* The Ecological Research Office, Edgewood Arsenal, has a set of the official wetland area maps and a copy of sections 718 through 731 of Article 66C of the Annotated Code of Maryland.

Wetlands and estuarine areas are the most productive of all the world's habitat types and their response to industrial and sanitary effluents is very complex. Small amounts of sanitary and some industrial effluents add to the available nutrients and boost the overall productivity of these areas. Larger amounts of the same "beneficial" effluents will cause eutrophication of the waters, a condition in which high nutrient levels and low oxygen levels promote abnormal plant growth and choke out animal life. Of course, even small amounts of many highly toxic industrial effluents may adversely affect all forms of aquatic life.

Although the wetlands and adjacent estuaries constitute a valuable resource worthy of every possible effort to avoid despoilment, no habitat within the installation is known to be sufficiently unique to warrant exclusive protection. However, the policy of limited access to most of the range areas has provided large areas of relatively undisturbed habitat and this policy should be continued.

C. Aesthetic Resources.

Edgewood Arsenal has an abundance of waterways, woodlands, tidal marshes, and grasslands. Restriction of public access, along with enlightened resource management, has had a beneficial effect on the general quality of the biota and habitats on the installation. Intensive use of the area has been avoided, thus enhancing natural beauty and environmental integrity. The headwaters of the Chesapeake Bay and the Gunpowder and Bush Rivers lend beauty to the surrounding land.

No formal nature trails yet exist at Edgewood Arsenal; however, work on a nature trail at Skipper's Point was started in the fall of 1974. Several existing access and foot trails will be incorporated into the final nature trail (figure 4).

D. Geological Resources.

The soils of Edgewood Arsenal are of the Atlantic Coastal Plain type; that is, soils which have been deposited by sedimentation rather than weathering from the underlying bedrock. They are of four major types: Sassafras loams, Keyport fine sandy loams, Elkton sandy loams, and Sassafras sandy loams. Table 7 lists the more important physical properties of these soils and figure 11 gives their locations on the installation.

Table 7. Physical Characteristics of Soil Types on Edgewood Arsenal

Type	Depth to high water table	Overall permeability	pH	Available moisture capacity to 30 inches	Probable severity of first disruptive action
	feet				
Sassafras (loams)	5 +	Moderate	4.0 to 5.0	High	Moderate
Keyport (fine sandy loam)	1.5 -2	Slow	4.0 to 5.0	High	Severe
Elkton (sandy loam)	0	Slow	4.0 to 5.0	High	Severe
Sassafras (sandy loam)	5 +	Moderate	4.0 to 5.0	High	Moderate

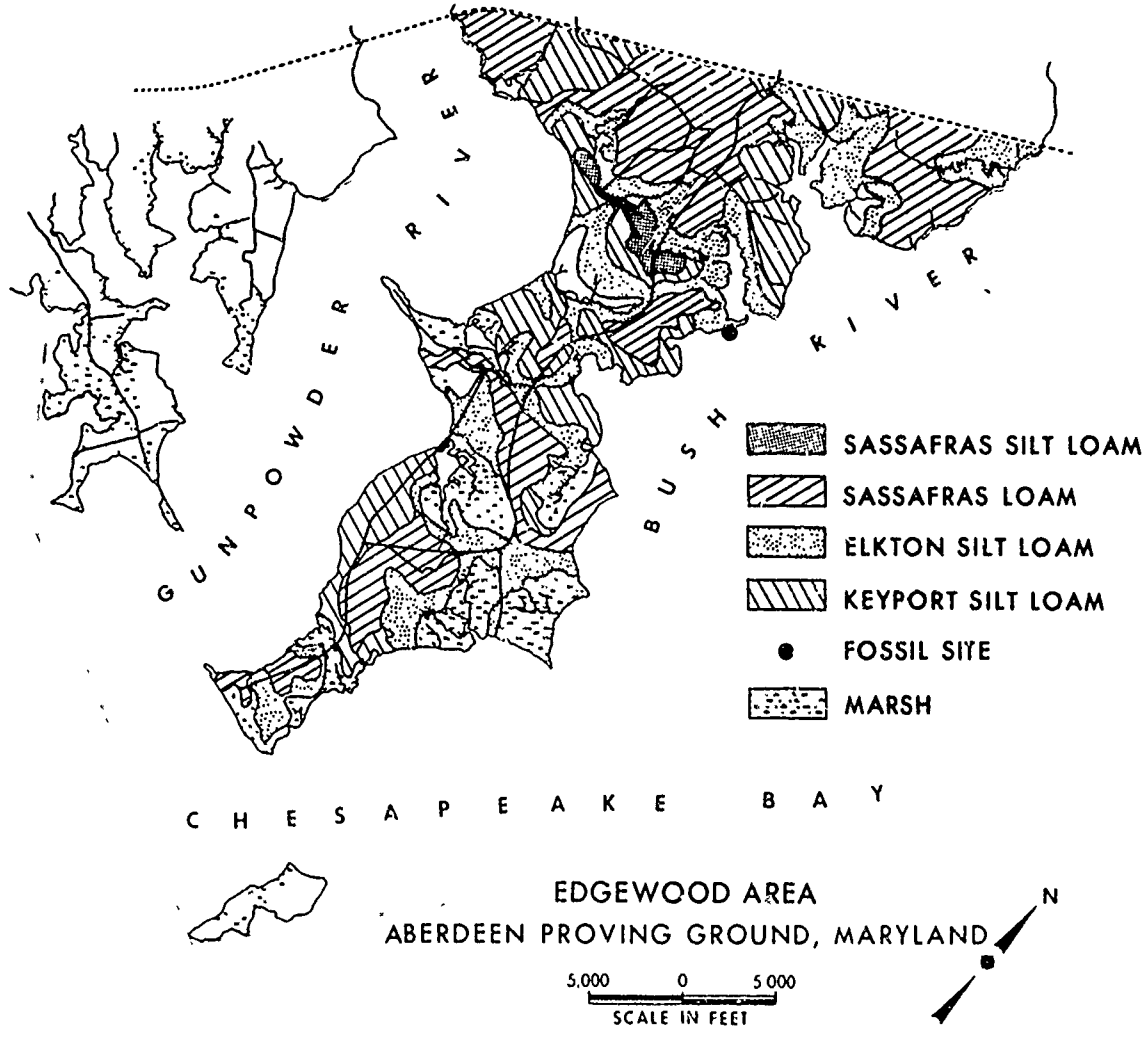


Figure 11. Soil Types

The one known fossil site at Aberdeen Proving Ground is located in "B" Field of the Edgewood Area. It is a Pleistocene sandstone formation containing Late to Post-Wisconsin specimens of fresh and brackish water invertebrates. The site has been examined by a team of paleontologists from the Smithsonian Institution and the specimens listed in figure 12 were identified. The assemblage is nearly identical to one below Washington, DC, and one in the middle part of the Rappahannock River in Virginia. Since this is only the third site of its type known to exist, its importance cannot be understated.

Class Bivalvia (clams)

Family Unionidae (the Pearly Fresh-water mussels)

Elliptio complanatus (abundant – 66% of specimens)
E. productus ? (moderately common – 8%)
Lampsilis sp. A (common – 10%)
Lampsilis sp. B (rare – 3%)
Villosa sp. indet. (rare – 4%)

Family Mytilidae (the ribbed mussels)

Brachiodontes recurvus (rare – 1 specimen)

Class Gastropoda (snails)

Family Pleuro ceridae (the river snails)

Goniobasis virginica (rare – 4%)

Family Planorbidae (the cylinder snails)

"Planorbid" snail (rare – 1%)

Figure 12. Species Recorded at the Gunpowder Neck Fossil Site

E. Archeological Resources.

The entire Gunpowder Neck area has a rich archeological heritage. Occupation by man apparently began in the Paleo-Indian period, 18,000 to 8000 years before the present (BP). These people were few and highly mobile. Consequently, sites and artifacts from this period are a rarity, but some artifacts characteristic of the epoch have been found at Edgewood Arsenal. Their weapons were typified by fluted spear points which are alleged to have possessed a peculiar advantage in killing High Pleistocene mammals.

This period was followed by the Archaic Culture, 8000 to 3500 years BP, which was typified by larger tribes, definite territories, and seasonal gatherings of about 100 people in villages.

The next period was short, 3500 to 3000 years BP, and is appropriately called the Transitional period. Considerable cultural change characterized this period. Pottery and soapstone vessels were used for the first time. Oyster harvesting which began in the Late Archaic period continued, but still at a minimal level.

The Woodland epoch, 3000 to 400 years BP, saw the use of ceramic pottery and the introduction of the bow. Oyster harvesting was accelerated and villages were large and relatively permanent.

In the Colonial and Federal periods, 400 years BP to the present, the native races were slowly decimated. Numerous Archaic, Transitional, Woodland, and Colonial sites are known.

The value of the archeological sites on Edgewood Arsenal has been greatly enhanced by the policy of restricted access which has protected the areas from exploitation and vandalism. The lack of farming since 1917 has prevented further ground disturbances. As a result, even though there are many archeological sites throughout the Upper Chesapeake Bay, those at Edgewood Arsenal are among the few that have been preserved in their

original state with chronological layering largely still intact. The importance of this preservation to the archeological community cannot be overstressed. While none of the sites at Edgewood Arsenal are officially recognized and protected, the Federal Antiquities Act prohibits the removal of Indian artifacts from Federal property. The Preservation of Historical and Archaeological Data Act, presently before Congress, would authorize Federal activities such as Aberdeen Proving Ground to release funds for the protection of sites threatened with destruction. Since most of the sites at Edgewood Arsenal are on the shorelines, they are being destroyed by erosion and would therefore fall under this act.

Data on the known archeological sites at Edgewood Arsenal are listed in table 8. Precise locations of the sites have been omitted from this report to protect their confidentiality. Persons with a *bona fide* need-to-know may have access to site maps and may obtain further information through the Facilities Engineering Directorate, Aberdeen Proving Ground, or the Ecological Research Office, Edgewood Arsenal.

F. Historical Resources.

From about 1608 when Captain John Smith sailed up the Bush River until 1917 when Gunpowder Neck Military Reservation was established, there has been continuous use of the area by white men. At one time, Edgewood Arsenal was the site of a 20-room mansion, numerous smaller homesteads and family burial plots, several schools, at least eight lavish duck hunting lodges, and two churches. The commerce on Gunpowder Neck apparently centered around the three general stores, a wheelwright's factory, and a tomato cannery.

The only remaining testimony to Gunpowder Neck's once rich and lively history are the Presbury family home (Quiet Lodge, circa 1740) and the Presbury Church (circa 1889 and possibly in part circa 1772).

The house was reconditioned and enlarged in 1924 and has since been used as quarters for field grade officers. The church, possibly the oldest standing Methodist church in the United States, was used both as a church and school for many years but has been in disuse since 1919. Articles have been written about both structures by the Edgewood Arsenal Information Office, but there have been no attempts at preservation of the church.

A number of Indian and Colonial sites at Edgewood Arsenal have been designated as historical sites by the State of Maryland (table 8). These sites include burial sites, shell middens, etc., and date from prehistoric times to circa 1890. There are only limited provisions for preserving historical sites.

G. Recreational Resources.

1. Hunting and Trapping.

The most popular wild game species hunted at Edgewood Arsenal include the white-tailed deer, gray squirrel, cottontail rabbit, bob-white quail, ring-necked pheasant, Canada goose, and the various species of ducks. Figure 13 shows hunting and trapping areas.

Aberdeen Proving Ground regulates hunting and fishing at Edgewood Arsenal. The Edgewood Arsenal Rod and Gun Club cooperates with the post game warden in policing the hunting areas. An Aberdeen Proving Ground hunting permit is required to hunt on Army land. A complete discussion of sport hunting and trapping may be found in the Installation Environmental Assessment of Aberdeen Proving Ground (section IV,G).

2. Fishing and Boating.

Fishing and crabbing are also very popular, the major sport fish species being bass, perch, catfish, and crappie.

Table 8. Archeological Resources

Number[a]	Culture[b]	Period[c]	Designated State historical site	Comments
HA 1	I	Paleo-Indian Woodland	X	Indian shell heaps found along shore. Points, shards, and a probable fluted point have been recovered.
	C			
HA 2	I	Archaic Woodland		Shell heap with many artifacts.
HA 11	I	Archaic		Stemmed points and other artifacts.
HA 12	I	Woodland		Shell heap.
	C		X	
	C		X	
HA 16	I	Archaic Woodland	X	Indian shell heap, one of the most productive sites in the area.
	C			
HA 19	I	Woodland		Indian shell heap; a few points have been recovered.
	C		X	Numerous bottle fragments of ca. 1880-1900 have been recovered.
HA 32	I	Archaic Woodland		Axes and a discoidal have been recovered.
HA 33	I	Archaic Woodland		A celt and an axe have been recovered.
HA 70	I	Archaic Woodland		Shell heap; a large variety of points have been found.
HA 73	I	Woodland		Shell heap.
HA 74	I	Woodland		Shell heap area formerly cultivated.
HA 75	I	Woodland		Extensive shell heap.
HA 76	I	Woodland		Small thick shell heap.
HA 77	I	Woodland		Shell heaps; deteriorating from erosion.
HA 80	I	Wood[illegible]d		Points, scrapers, knives, pottery, and flakes have been recovered.
1	I	Woodland		Shell heap and beach collecting site.
2	I	Archaic Transitional		Shell heap and beach collecting site. Beach collecting.

[a] State of Maryland Archeological Survey site designations. (Mr. Paul Cresshull, Biomedical Laboratory, and Mr. Tyler Bastian, state archeologist, were the primary sources for the data in this table.)
[b] I = Indian; C = Colonial.
[c] As explained in text.

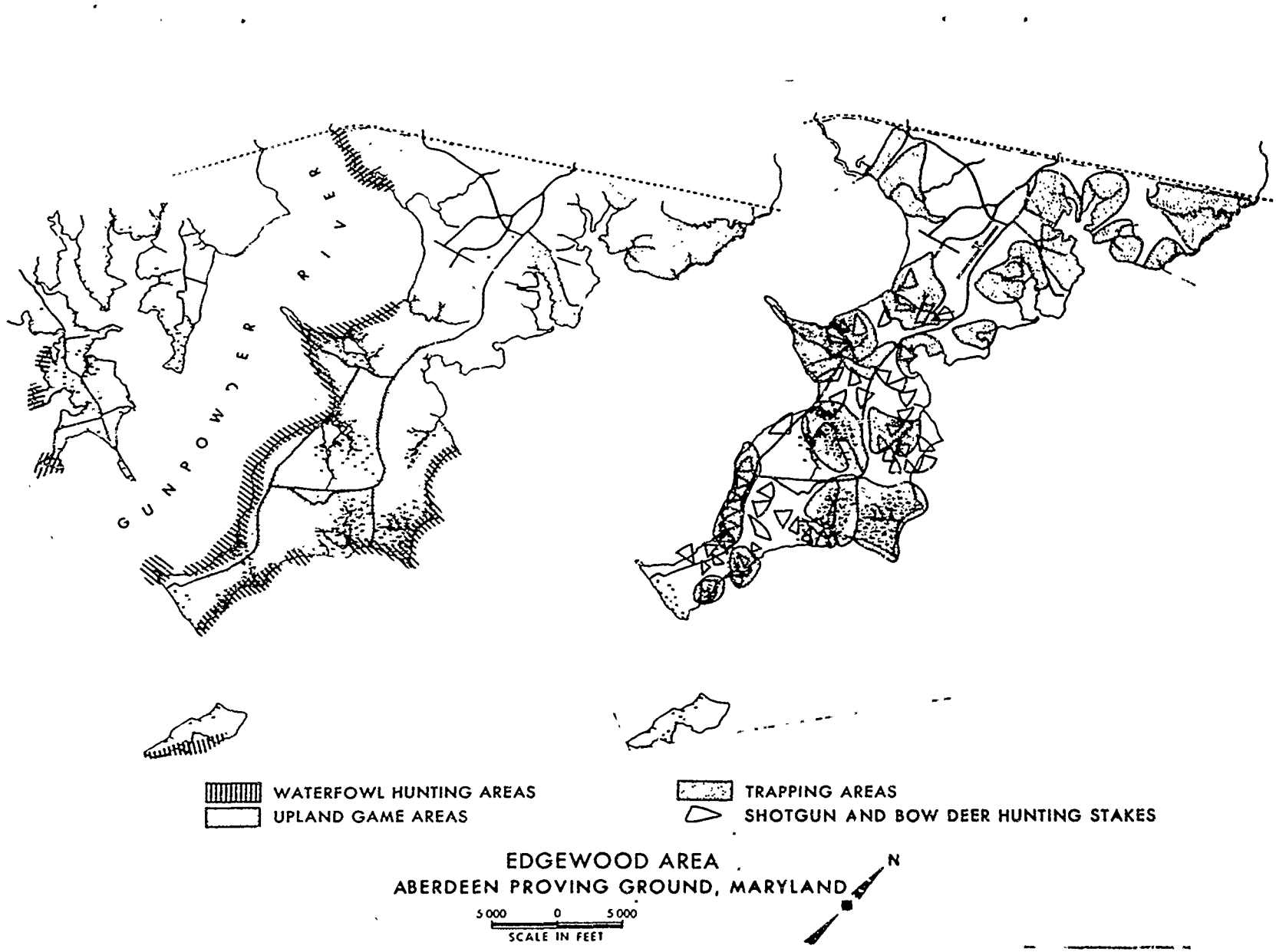


Figure 13. Hunting and Trapping Areas

Boating is a very popular activity at Edgewood Arsenal. A dock which provides sailboats, rowboats, and canoes is operated by the Recreation Services Division Outdoor Recreation Section at Skipper's Point. The boating season is from 1 May to 15 October.

The Gunpowder Boat Club caters primarily to individuals with powerboats and sailboats. The club open to Edgewood Arsenal civilian and military personnel, sponsors a variety of activities during the boating season. The map in figure 14 gives the locations of the club and docks.

3. Golf and Tennis.

There is a clubhouse and nine-hole golf course located just east of the Edgewood Gate. Tennis, an increasingly popular sport, is played on five outdoor tennis courts operated by the Recreation Services Division Outdoor Recreation Section.

4. Flying and Riding Clubs.

Edgewood Arsenal has a successful flying club, which is headquartered at Weide Army Airfield. It offers aircraft rental and flying lessons, in addition to facilities for repair and maintenance of member-owned aircraft. The club is authorized to use the Army airfield runways and control facility.

The post has a saddle club that provides riding trails and facilities for boarding members' horses. In addition, the club owns several mounts available for use by members and guests who do not own their own horses.

5. Swimming and Picnicking.

Swimming in the waters adjacent to Edgewood Arsenal is prohibited. Recreation Services Division and the APG [illegible] System operate two swimming pools on post. Attractive and well-equipped picnic areas are located at Skipper's Point and CAPA Field. In the pleasant summer months, these areas are used extensively.

6. Gymnasium.

Edgewood Arsenal's Hoyle Gymnasium is a fully-equipped sports center. The facilities include basketball courts, paddle ball and squash courts, weight room, sauna, bowling lanes, and horseshoe pits.

Recreation Services Division also operates a loan service for tents, sleeping bags, skis, and similar equipment in the building.

V. ENVIRONMENTAL EFFECTS OF OPERATIONS AT EDGEWOOD ARSENAL.

A. Economic Effects.

In fiscal year 1973, Edgewood Arsenal's payroll was $33.6 million for civilians and $4.0 million for military personnel.

The average annual salary for civilians and the military, respectively, is $16,860 and $9,680, whereas the average annual salary of a worker in Harford County is $9,299. Harford County has a workforce of approximately 48,000;* roughly 5% of this workforce is employed by Edgewood Arsenal. Considering the above statistics, it is clear that Edgewood Arsenal has a substantial impact on the economy of Harford County.

*Harford County Economic Development Commission.

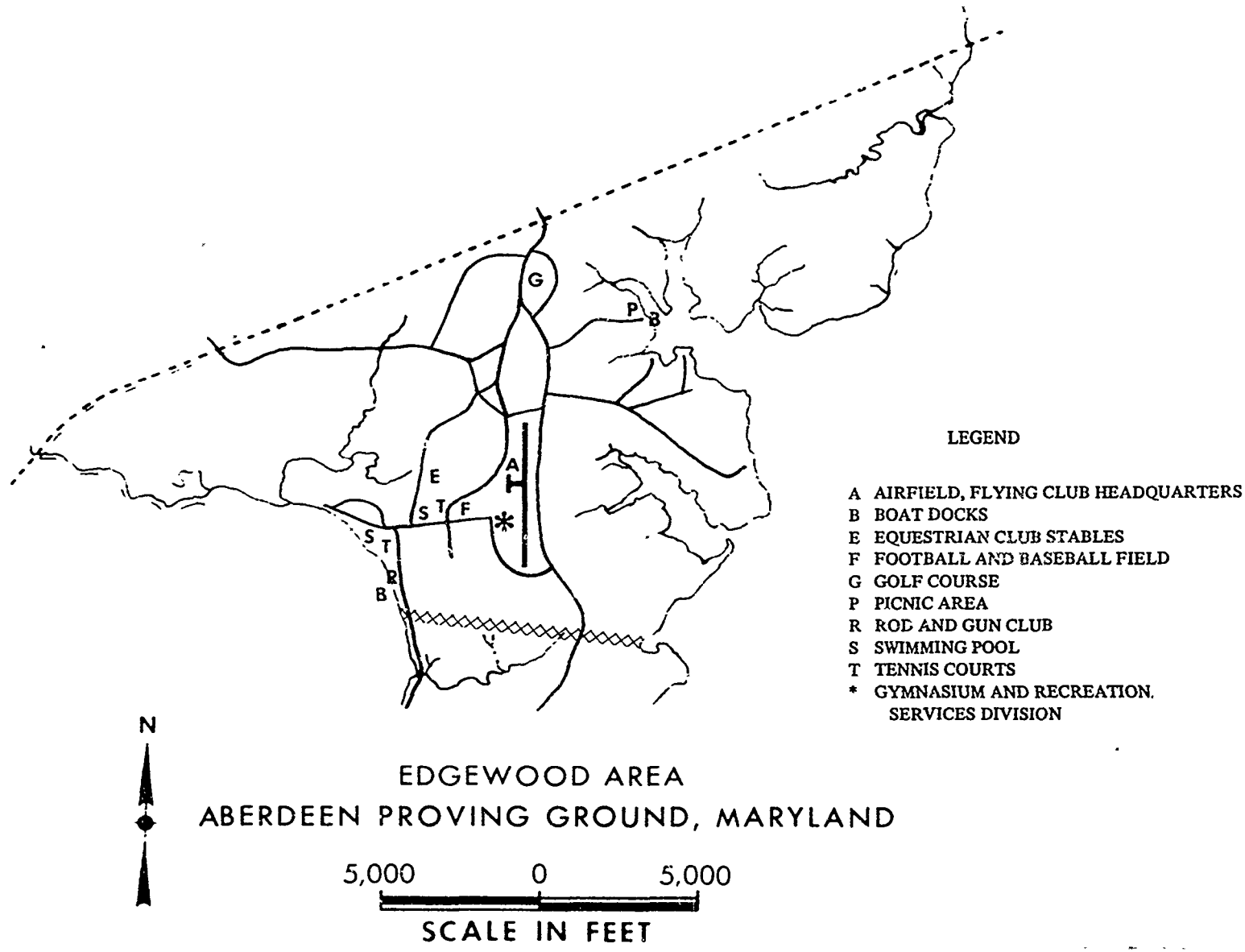


Figure 14. Recreational Facilities

Housing at Edgewood Arsenal is provided through the Housing Office at Aberdeen Proving Ground. There are 554 family units at Edgewood Arsenal, of which 308 are occupied by military personnel and 47 are vacant. There are 1,092 military personnel at Edgewood Arsenal, many of whom utilize privately-owned housing.

Post Exchange outlets on Edgewood Arsenal include a service station, retail outlets (PX), a family center, beauty and barber shops, a small cash and carry food store, and a contracted laundry service. The commissary at Edgewood Arsenal has an average monthly sales volume of $300,000.

During FY73, local contractors (those within a 75-mile radius of Edgewood Arsenal) provided goods and services worth $6.3 million. When this figure is combined with the total salaries paid by Edgewood Arsenal, we see that a total of $43.9 million dollars is contributed to the economy of the area. Even though some of this money is returned directly to the Government through Government-owned housing and exchange services made available to military personnel, this figure still represents about 2% of the area's total net buying income ($2.6 million), a substantial amount for any single employer.

B. Public Utilities.

The fossil fuels consumed at Edgewood Arsenal consist predominately of No. 2 fuel oil and natural gas, with lesser amounts of kerosene and liquified petroleum (LP) gas. No fuel oil other than No. 2 has been used at Edgewood Arsenal in the last 2 years. Table 9 presents fuel consumption for FY73.

Table 9. Fossil Fuel Consumption for FY73

Fuel	Amount (X 1,000)	Major uses
No. 2 fuel oil	4,095 gal.	Heating and hot water
Kerosene	3.6 gal.	Heating and cleaning solvent
Propane	109 lb	Heating and laboratory use
Natural gas	5,116 cu ft	Family dwellings
Av gas	14 gal.	Internal-combustion engine
Mo gas	201 gal.	Internal-combustion engine
JP-4	39 gal.	Internal-combustion engine
Diesel fuel	117 gal.	Internal-combustion engine

Firing boilers for hot water and for heat accounts for the largest single use of fuel (low sulfur No. 2 fuel oil). There are 34 boilers at Edgewood Arsenal that have capacity in excess of 1×10^6 British thermal units (Btu per hour and three boiler sites with an output greater than 10×10^6 Btu per hour (buildings E3312 with 135×10^6, E5126 with 161×10^6, and E5330 with 322×10^6 Btu per hour. Boiler blowdown, which contains caustic sodium hydroxide, sodium polyphosphate, and extract quebracho, empties into the sanitary sewer.

Electric power is purchased from the Baltimore Gas and Electric Company, a member of the Pennsylvania, Jersey, Maryland power grid. Table 10 details the power usage. The Baltimore Gas and Electric Company reports that a 50% increase in power consumption on the installation would not make a significant impact on their total power demand.

Table 10. Electric Power Consumption (CY 1970-1973)

CY 1970	58 X 10^6 kw-hr
CY 1971	61 X 10^6 kw-hr
CY 1972	59 X 10^6 kw-hr
CY 1973 (estimated)	(60) X 10^6 kw-hr

Water supply is provided from wells and reservoirs on Federal land. Average daily demand for water is 2.3 million gallons per day (gpd). Table 11 presents data on sewage and water demands; figure 15 shows location of major utilities. The filter backwash from the water treatment plant at building E1464 enters the sanitary sewer system. The Van Bibber water treatment plant has a newly installed centrifugal dewatering system.

Table 11. Locations and Capacities of Water and Sewage Treatment Plants

Type	Location/Source	Capacity	Percent biological oxygen demand	Type of service or level of treatment
		million gpd		
Water - Edgewood Arsenal				
Van Bibber water treatment plant	Atkisson Reservoir	4.0		Primary
Wells	Buildings E4054, E3167, E3086, E4055, E3183, E3088	2.0		Standby
Carroll Island	Building E7930	0.25		Local
"H" Field	Building E1464	0.239		Local
Sewage - Edgewood Arsenal				
Main Plant	Building E3853	2.0	>85	Secondary
Biological Sensor	Building E2188	0.027	>85	Secondary
Carroll Island	Building E7930	0.001	>85	Secondary
Nike Site	Building E6820	0.5	30-65	Secondary
Eagle Point	Buildings E2354, E2342	<0.1	30-65	Secondary
Skipper's Point	Building E2188	0.027	>85	Secondary

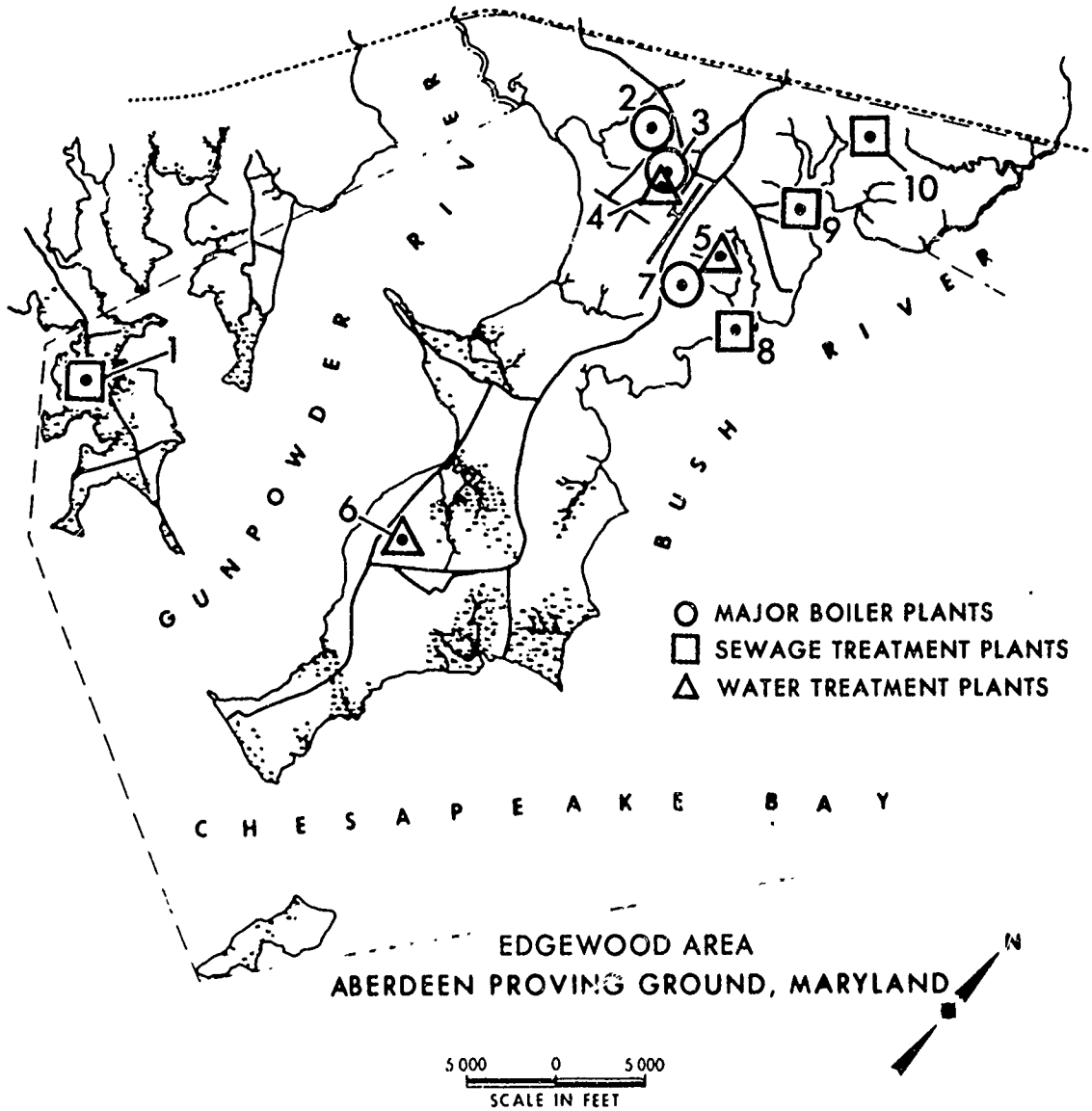


Figure 15. Location of Major Utilities

The sewage treatment plants, all on Federal land, handle an average of 1.1 million gpd. The sludge from these facilities is dried and placed in the sanitary landfill (see section V, D, of this report).

Most buildings have individual air-cooling units or window air conditioners. None is considered to create a noise problem. The approximately 10 million gallons per year of used cooling water are discharged into the storm sewers. Since this water receives no additives other than those it receives at the water treatment plant, this release does not constitute a problem.

C. Public Health and Safety.

Aberdeen Proving Ground provides all post services to its tenants, including military police, hospitals and dispensaries, and fire protection. Edgewood Arsenal has no responsibility for or control over these services.

A potential threat to the public welfare at Edgewood is posed by chemical agents. Agents are stored on the installation (see part J of this section) and are used in laboratory research. In addition, large quantities of agents were dumped on Gunpowder Neck during and after World Wars I and II (see part E of this section).

Edgewood Arsenal has established a Toxic Exposure Aid Station in building E3100 of the Biomedical Laboratory to handle exposures to toxic materials. The Toxic Exposure Aid Station, which is equipped for decontamination of personnel and clothing, has an adequate supply of atropine and 2-PAM chloride (anti-symptomatic and antidote, respectively, for nerve agents), ointments (for blister agents), respirators, and protective clothing for aid station attendants.* By use of the adjacent ward area, 24 patients can be accommodated in beds and, in an emergency, the aid station can be pressed into service as an operating theater.

The Toxic Exposure Aid Station treats all cases of suspected agent exposure (an average of two or three cases per month). In the last 5 years, 16 cases of suspected agent contact were reported after duty hours.

In addition, personnel who work in potential exposure areas are issued protective masks which are inspected annually. Edgewood Arsenal also maintains a Chemical Agent Incident Communications Center which responds to and coordinates all activities in the event of a major incident. Regular drills are held to keep personnel proficient.

The accident record for Aberdeen Proving Ground for FY73 is shown in table 12.

Table 12. Accident Experience, FY73

Area	Disabling accidents per million man-days		Accidents per million vehicle miles	Total cost per million man-days
	Military	Civilians	Military	
Edgewood Arsenal	16.12	0.47	5.66	$147K
Total APG installation	19.62	1.11	3.55	$715K
FY73 target	26.40	1.05	2.85	–

D. Solid Waste Disposal.

1. Landfill Operations.

Sanitary and construction landfill operations are provided by Aberdeen Proving Ground to all of its tenants; Edgewood Arsenal has no responsibility for or control over these operations.

* Procedures are found in SMUEA-RMC(2), Standard Operating Procedures for the Toxic Exposure Aid Station, 23 February 1971, with Addendum dated 1 July 1974, and in HQ APG Annex 1, Chemical Accident/Incident Control Plan to APG Disaster Control Plan dated 23 August 1973. Details of fire protection and range safety can be found in the APG IEA.

Based upon the number of employees and the size of the operations, it is estimated that Edgewood Arsenal generates about 15% of the waste produced at Aberdeen Proving Ground. Solid radioactive waste from Edgewood Arsenal is not buried at Aberdeen Proving Ground (see section V, F, 2).

For a detailed discussion of landfill operation, see the APG IEA.

2. Incinerators.

The Aberdeen Proving Ground Smokatrol Model 600 incinerator for classified documents, located in the Edgewood area, has been deactivated and disconnected and will not be operated by Edgewood Arsenal or any other personnel.

Edgewood Arsenal operates and is responsible for three pathological incinerators. Two are located immediately east of building E3226.

One incinerator is a 475-lb/hr model manufactured by Environmental Control Systems of Charlotte, North Carolina. It is oil-fired, with after-burner and scrubber, and was designed to exceed all standards, both Federal and State.

For emergency disposal, a second pathological incinerator is maintained as backup to the Environmental Control Systems unit. This incinerator is a Silent Glow Model CTH, Serial 725, which was purchased in 1966. It was relined with refractory material in July-August 1971 and checked for particulate emissions shortly thereafter by personnel of the US Army Environmental Hygiene Agency (AEHA). Source sampling was conducted in accordance with Federal incinerator test specifications, which are summarized in appendix B. The AEHA report states that visible emissions were never greater than No. 2 on the Ringelmann scale. The data show the average emission from the incinerator is 0.10 grain per standard cubic foot (gr/scf) at 12% CO_2. (See appendix C). The Silent Glow model will be operated only when the Environmental Control Systems unit is inoperative.

The third pathological incinerator is located in building E2338. The unit is a Model S incinerator made by Incinerator Engineering Division of Waste Industries. The solid hearth design with a scrubber and secondary gas burner was designed for burning type 4 waste generated by laboratories including our Biomedical Research Laboratory. The unit was tested in May 1971 by AEHA for burning type O waste at a charging rate of 300 pounds per hour (20 pounds at 4-minute intervals). The average particulate emissions were reported to be 0.03 gr/scf of dry flue gas corrected to 12% CO_2. Test specifications are summarized in appendix D. Visible emissions were reported below No. 1 on the Ringelmann scale at all times during the sampling period. At present, the Model S incinerator will be used only for the dispsoal of decontaminated type O wastes (paper, cardboard, plastics, glass, etc). It will not be used for other purposes until tests show the unit meets Maryland standards for particulate visible emissions during the burning of other waste.

The ash from the incinerators is disposed of in the sanitary landfill in the Aberdeen Area.

3. Open Burning.

The US Army Technical Escort Center, a military element of Edgewood Arsenal, has among other responsibilities, the mission for the safe disposal of chemical agents and munitions or other hazardous materials at Edgewood Arsenal and response to civil authorities (Federal, State, and local) under emergency situations as directed. The Center transports and disposes of chemically detoxified waste generated by Edgewood Arsenal elements. Technical Escort Center personnel currently dispose of this type waste by open pit burning or detonation. This method is preferable over alternatives which could perpetuate or increase the hazards involved with these materials. Edgewood Arsenal is studying disposal methods and development of alternatives which include incinerators and molten salt thermal reactors. Both of these may be practical alternatives to disposal of

some of the hazardous and explosive wastes. Burning is done on an as-needed basis, which is presently 1 day per month. The controls used by Technical Escort during open burning include:

a. Wind direction is monitored to insure that any air pollution or nuisance problem will be confined to the property controlled by the APG-Edgewood Arsenal complex.

b. There are no occupied buildings or heavily traveled public roadways within 500 yards of the burning areas.

c. Only wood dunnage and No. 2 fuel oil are used as the primary fuel. No material which produces dense smoke when burned, including but not limited to tires and roofing material, is used as fuel. Gasoline or other highly volatile liquids are not used as the primary fuel.

d. No burning is to be started if a "forecast stage" is in effect or if a temperature inversion is present.

e. The Harford County Health Department Bureau of Environmental Health is notified by the Edgewood Arsenal Safety Office before each burning operation.

The majority of Edgewood Arsenal's mission-related effluents are derived from the arsenal's complex of biomedical, chemical, and physical laboratories. These emissions are agreed to be exempt from compliance with Maryland State Air Pollution Standards Regulation 10.03.35, paragraph 11G6. Fabrication operations at Edgewood Arsenal meet the threshold limit values of the Occupational Safety and Health Act and there are no visible emissions to the outside air. There appears to be no need to negotiate a plan for compliance for these operations.

Open burning of flammable, liquid wastes is conducted about once a month, on weekends, in a pit near the Salvage Yard. This burning of hazardous wastes is part of the "hot drills" conducted by the APG Fire Department.

These operations are necessary and are conducted in compliance with applicable laws. Some adverse effects such as air pollution and ground contamination, through leaching, may be lessened by processing the detoxified agents in the Silent Glow incinerator. It is expected that this incinerator will also be used for the burning of agent-contaminated laboratory wastes and detoxified agents, when proper detection instrumentation and controls are approved by AEHA and EPA.

4. Demilitarization Operations.

Demilitarization of excess high explosive (HE) and white phosphorus (WP) rounds which have misfired is accomplished by the Technical Escort Center by detonation in "J" Field (figure 16). Larger quantities of HE are detonated in "O" Field.

Technical Escort Center disposes of quantities of CS (200 lb in the first 6 months of FY74) by burning with dunnage at "O" Field. The last approved disposal of lethal agents was a procedure test in February 1973 involving six GB-filled M55 (10.5-lb) rockets without explosives. The agent fill was detoxified in a 10% $NaCO_3$ solution by drilling the rockets under solution and flushing with the solution. The inside of the rocket was certified agent-free, and the M55 rockets with all components were detonated and burned at "O" Field by Technical Escort Center. The liquid waste was burned with dunnage. This was the only demilitarization of other than laboratory quantities of lethal agents since the passage of Public Law 91-441.

Laboratory quantities of detoxified agent (up to about 1 liter) are also disposed of by burning at "O" Field. Periodically the ash is covered over with fresh earth and the same sites are used again. Liquid wastes of detoxified lethal agents in excess of about 1 liter are disposed of in the sanitary sewer at building E5625. The reagents with which lethal agents are detoxified are outlined in table 13.

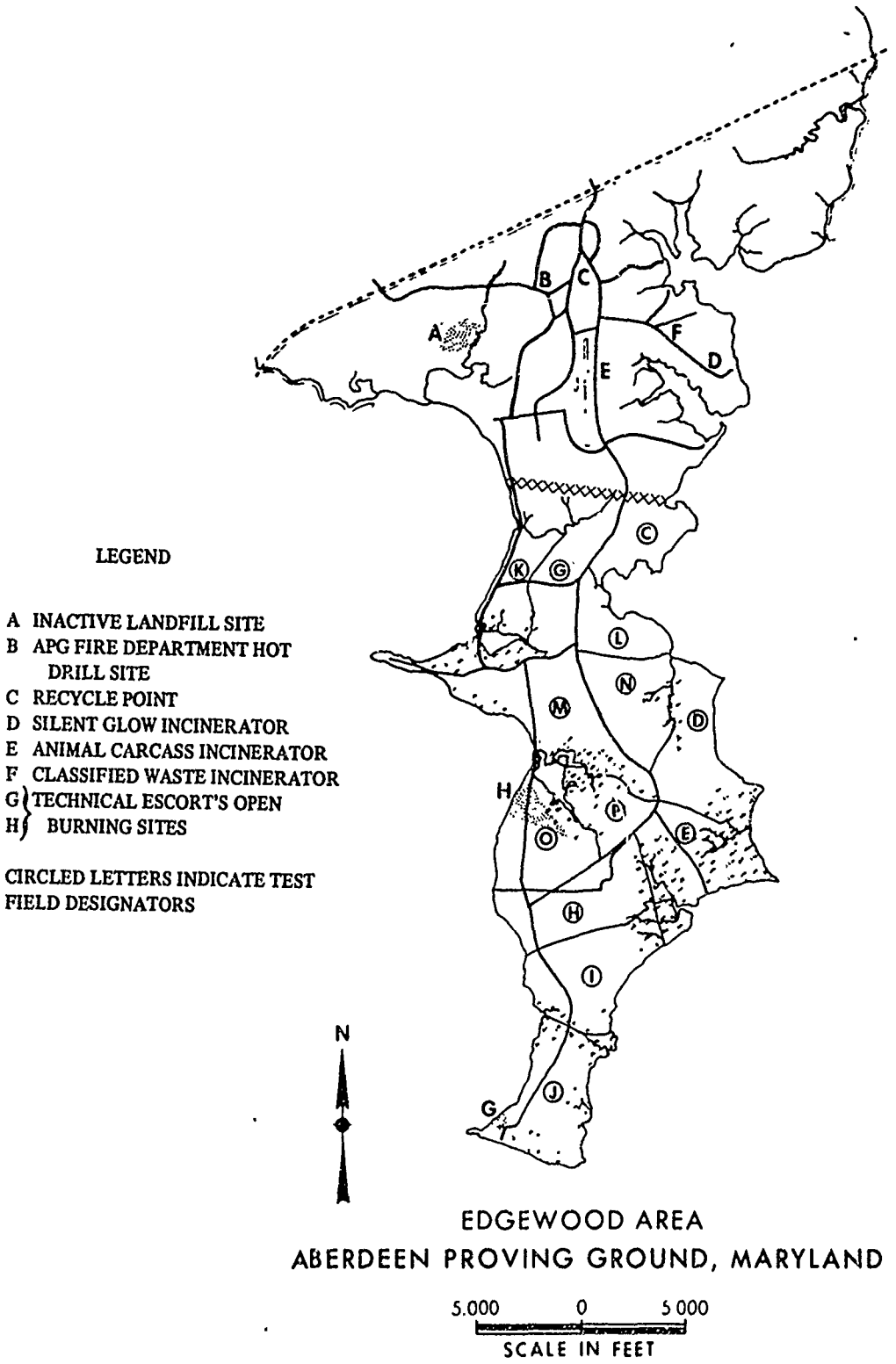


Figure 16. Solid Waste Disposal Sites

Table 13. Detoxification of Lethal Agents

Agent	Detoxification reagents	Reaction products	pH of final solution
GB	NaOH or Na_2CO_3	Organic fluorosodium salts and HF	10-11 approximately 7
VX	HCl and HTH®	Various organics and SO_4	4-5
HD	HTH®	Various organics and SO_4	5
	Monoethanolamine	Cyclic thiomorpholine	8-9
	STB	Various organics and SO_4	10-11

5. Recycling Operations.

Excess and demilitarized property including scrap metal, lumber, and material is sold by the APG Property Disposal Office.

A recycling program is supervised/sponsored by the Edgewood Arsenal Officers' Wives Club (figure 16). The pickup point is at the Edgewood Arsenal Commissary. Recycled items include glass (bottles, etc.), cans (aluminum, steel, mixed metals), and papers (newspapers, magazines). The glass is sold to Maryland Glass Company, Baltimore, Maryland; the cans are sold to M & T Chemicals Co., Inc., Baltimore, Maryland; and the paper is picked up by the Boy Scouts. Further information on the recycling program is given in the APG IEA.

E. Contaminated Areas.

Edgewood Arsenal has large areas of land and several buildings which are considered contaminated. The three basic types of contamination are from pyrotechnic munitions, toxic agents, and radioactive materials. The sites discussed below may be located in figure 17 and additional details are shown in table 14.

1. The Pooles Island Range (area 4) is a 200-acre area, accessible only by boat, near the tip of Gunpowder Neck. It is composed of woody lowlands and large stretches (about 30%) of marsh. The island is contaminated with various projectiles and rockets as well as unexploded cased munitions located on the surface and below the surface to unknown depths. All of the projectiles fired into the area had mechanical time fuzes.

2. Carroll Island (area 6) was a major chemical agent testing site for Edgewood Arsenal from 1949 to 1971. Many of the contaminants on Carroll Island become harmless when exposed to the elements for short periods of time. Other agents such as VX (a persistent nerve agent) are sufficiently toxic and persistent to present a danger for many months or even years. In addition to the agent contamination, there are a few unexploded agent-filled munitions known to be scattered over the island. Carroll Island is considered one of the installation's most hazardous areas.

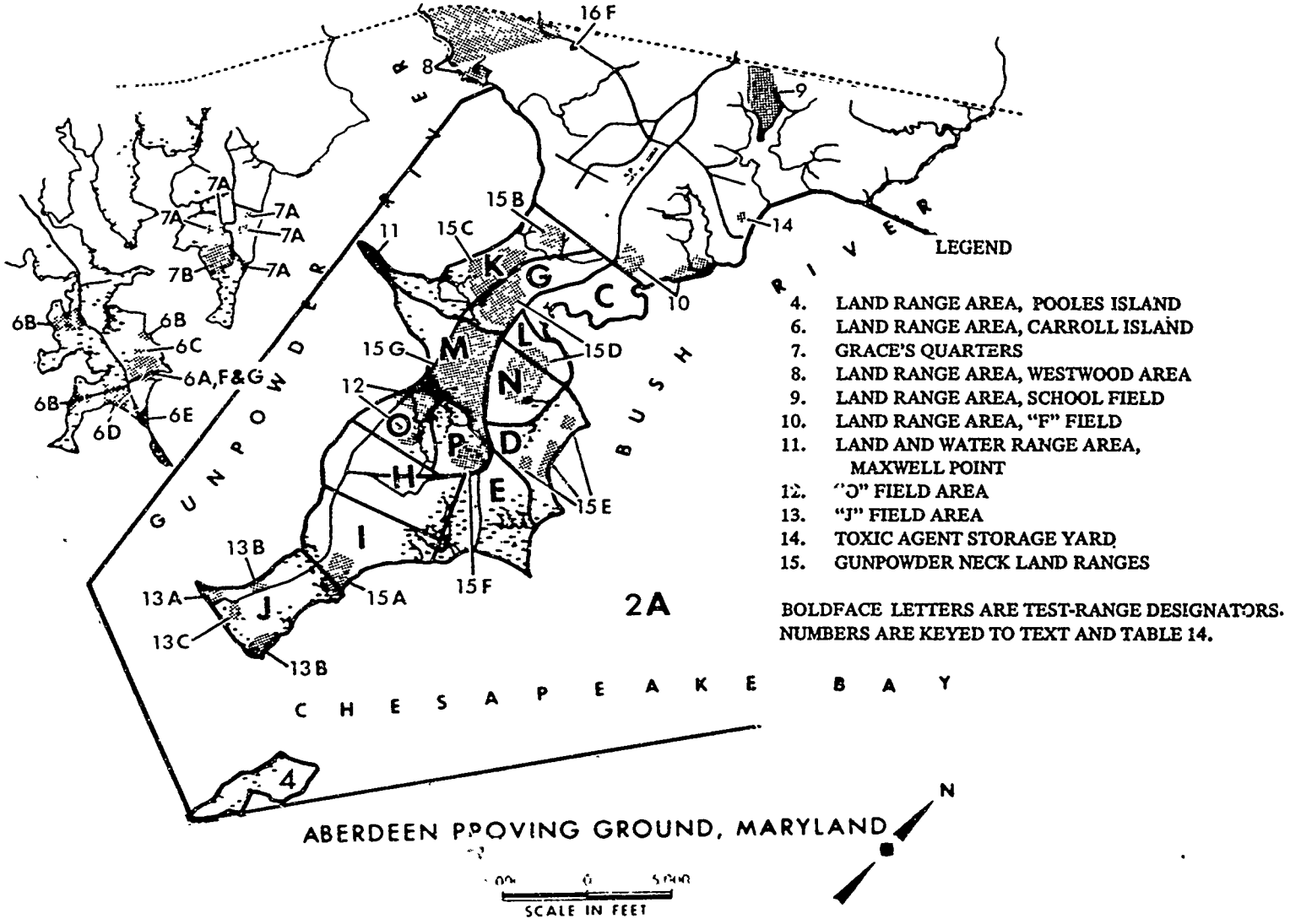


Figure 17. Contaminated Areas and Test Ranges

Table 14. Contaminated Areas of Edgewood Arsenal

Location in figure 17	Substance	Quantity	Munition type	Area	Time period*	Activity	Current status
4	Explosive - ammunition High explosive	Estimated 300,000 rounds: 2.75-inch mortar and various other calibers from 1.55 mm to 16 inches with various explosive weights	Projectiles and rockets	200 acres	Continuous since 1917	Testing	Active
6A Soil contamination	CS-1	3700 Pounds	Unconfirmed	1050 acres (including water area)	VW	Testing	Inactive
	CS-2	700			VW		
6B Dump	VX	600			KW, VW		
6C CS	DBMP	700			VW		
6D Soil contamination	TelVar	1000			KW, VW		
	BZ	300			VW		
6E Dumps	Talcum powder	5500			VW		
6F VX-HD	Furfural	300			VW		
6G 4.2-inch mortar	TEA	250			VW		
Impact area	Chloroform and dye	300			VW		
	CN/DM	200			VW		
	NaOH	500			KW, VW		
	GB	500			KW, VW		
	WP	200			KW, VW		
	CS/DM	150			VW		
	DM/HP	50			VW		
	Isopropyl alcohol	100			KW, VW		
	Combined anticholinesterases	50			KW		
	EDA	50			KW		
	GA	200			KW, VW		
	TOF	30			VW		
	Signal smokes	150			KW, VW		
	1,2,3 Trichloropropane	15			VW		
	DM	50			KW, VW		
	FS	50			KW, VW		
	Methylacetoacetate	20			VW		
	EA 1356	10			VW		
	Bis	15			VW		
	HD	10			KW		
	BBC	10			KW, VW		
	CN	20			KW, VW		
	GD	5			KW		
	EA 3834	5			VW		

Table 14. (Continued)

Location in figure 17	Substance	Quantity	Munition type	Area	Time period*	Activity	Current status
	EA 2528	5 Pounds	Unconfirmed		VW		
	EA 3990	3	↓		VW		
	DEHP	3	↓		VW		
	Unexploded chemical munition	100,000 Rounds	Mortar		WW II		
	Disposal pits	Unknown					
7	VX	500 Pounds	Uncontained	890 acres	KW, VW	Testing	Inactive
	HD	50 ↓	Uncontained		WW II		
	Disposal pits	Unknown			Continuous 1950-1969	Demilitarization	Inactive
8	HD	400 Pounds	Uncontained	523 acres	WW II, KW	Testing	Inactive
	WP	400 ↓	Bombs and grenades		WW II, KW		
	Napalm	50,000 Gallons	Bombs		WW II, KW		
	Radioactive tantalum	1 Source	Uncontained		KW		
	Radioactive tantalum	20 Sources	Pipe encased in concrete		KW		
	Pyrotechnics	30,000 Pounds	Grenades and bombs		KW		
9	Napalm	200,000 Gallons	Unconfined	1450 acres	KW, VW	Testing	Inactive
	Octal	75,000 ↓	Unconfined		KW, VW		
	WP	2,000 Pounds	57-mm		KW, VW		
	Smoke	50,000	Grenades		KW, VW		
	High explosive	2,000	Bursters		KW, VW		
10	CS-1 and CS-2	50	Unconfined	72 acres	VW		
	CN	50	Unconfined		KW, VW		
	Incendiaries	100 ↓	Grenade		KW, VW		
	Flame fuels	10,000 Gallons	Unconfined		KW, VW		
11	CS	10,000 Pounds	Unconfined	220 acres	WW II, KW, VW	Testing	Inactive
	Fog oil	3,000,000 Gallons	Unconfined		WW II, KW, VW		
	Mortar						
	Irritant smoke						
12	Disposal pits	Unknown	All types	259 acres	WW II, KW, VW	Disposal	Inactive
13	Disposal pits	Unknown	All types	135 acres	WW II, KW, VW	Disposal	Active
	CS	300 Pounds	Unconfined		KW, VW		
	GB	80	Rockets		KW, VW		
	GA	80	Rockets		KW, VW		
	VX	20	Rockets		KW, VW		
	BZ	20 ↓	Rockets		VW		

Table 14. (Continued)

Location in figure 17	Substance	Quantity	Munition type	Area	Time period*	Activity	Current status
14	H, L, FS		One-ton containers	162,500 square feet	WW II, KW, VW	Storage	Active
15	Explosive - ammunition High explosive Armor piercing Anti-Personnel Canister Incendiary Smoke Practice Illuminating	Estimated 1,000,000 rounds: all calibers up to 280 mm and components thereof with various weights	Projectiles Bombs Mines Grenades Rockets Small arms	10,000 acres	Continuous since 1917	Training and testing	Active
	CBR - ammunition: Mustard Irritant gases	Estimated 500,000				Training	Inactive

* WW = World War; KW = Korean war; VW = Vietnam war.

3. Grace's Quarters (area 7) has been used as an agent disposal area. There are several disposal pits, the contents of which were not recorded. The soil at site 7B (figure 17) is known to have been contaminated by VX and mustard (HD).

4. The Westwood Range (area 8) contains a wide variety of contaminants including radioactive material, pyrotechnics, and HD. Because of the extensive contamination, this range is considered to be a hazardous area.

5. School Field (area 9) contains largely incendiary munitions and is considered hazardous. The intermittent testing programs conducted at School Field Range were terminated in March 1974.

6. "F" Field (area 10) also contains various incendiary munitions. Although it is considered a hazardous area, it would be one of the easiest areas to decontaminate for unrestricted use.

7. "O" Field (area 12) is believed to be the most hazardous area on Gunpowder Neck. The amounts and specific types of contamination are unknown. The area was used as a disposal site for allied and enemy chemical agents during and following World War II. Clearing operations are currently in progress and ecological surveys are being conducted periodically by the Ecological Research Office, Edgewood Arsenal.

8. "J" Field (area 13) is the site of the disposal pits operated by Technical Escort Center for the demilitarization of munitions. The area is also contaminated with small amounts of WP.

9. The Chemical Agent Storage Yard (area 14) is discussed in paragraph J of this section.

10. The other land range areas of Gunpowder Neck have been put to various uses. Areas 15A and 15B (figure 17) were used as a dump site for unknown contaminants. Area 15C was used as a smoke and flame range, while area 15D was an impact area for chemical mortars. The testing of G, CN, CS, and HD rounds was conducted at area 15E. Area 15F contains unidentified duds. Area 15G, one of the few remaining active test areas, is currently used for testing nonlethal simulants and smokes and in the past was a bombing range.

11. The land and water in the vicinity of Maxwell Point (area 11) has been saturated by a large amount of fog oil. The land in this area could be decontaminated; the water area cannot, although decontamination through natural processes is occurring. Maxwell Point Range and the adjacent area of the Gunpowder River are currently considered hazardous.

12 Buildings.

In addition to the contaminated areas already discussed, 42 buildings at Edgewood Arsenal are considered contaminated to some degree. These buildings which have been or are being used for research, storage, manufacturing, and testing are posted as are all the contaminated areas.

Contamination at Edgewood Arsenal is a serious problem. Wooded areas and marshy lowlands make access to some of the contaminated areas difficult. The fact that inert as well as live rounds (many of which have lost their identifying markings) have been used makes it difficult and hazardous to attempt to clear an area. Even if decontamination were attempted, the environmental consequences would be massive. Such an operation would require removal of all vegetation and soil to a depth of 10 feet or more. Further, the cost of such an effort would be immense and the resulting land would still not be certifiable for unrestricted use. These areas should be fenced and maintained in perpetuity under Federal control.

F. Manufacturing and Laboratory Emissions.

1. Air Factors.

The atmospheric emissions for which Edgewood Arsenal is responsible or which it controls are those resulting from laboratory, pilot plant and maintenance operations and two small production sites; they do not

include emissions from installation operations (boiler plants, etc.) or services. Locations and the emissions associated with them are presented in table 15.

The plasticized white phosphorus (PWP) plant was engaged in milling and specialty-coating elemental phosphorus and loading it into munitions under a contract with the Air Force. This operation was completed in July 1973. The plant is now in standby status. The pilot plant is engaged in small-lot production of chemical agents. All of its gas and particulate effluents are passed through particulate and charcoal filters.

The fabricating and maintenance shops (appendix D, table D-1) are operated to supply in-house requirements for prototypes and modification of existing equipment. In addition, the facilities are available to the Procurement Directorate for production of items not economically available from civilian suppliers. The air and water emissions of these facilities are detailed in tables 15 and 16, respectively. All of the agent-related emissions are passed through particulate and charcoal filters before passing to the environment. The other effluents are like those of similar industrial facilities. Although they do contain polluting compounds and their abatement should be a positive command goal, they do not appear to pose unacceptable threats to environmental quality.

The laboratory facilities of Edgewood Arsenal are probably unique to the US Army. Dealing as they do with lethal agents and other toxicants and byproducts about which little is known, it is difficult to assess their potential impact on the environment. The air monitoring program has revealed no problems with agents. Lacking instack monitors, it is not possible to ascertain what portion of the air pollution at Edgewood Arsenal is due to installation operations and what portion is imported from nearby metropolitan areas.

Edgewood Arsenal appears to have its emissions under control.

2. Radiation Factors.

A Nuclear Regulatory Commission type A broad license allows Edgewood Arsenal to possess two curies of each radioisotope between atomic numbers 3 and 83 inclusive for research and development activities. In addition, the license and others allow the following maximum quantities for use at Edgewood Arsenal:

124 Curies of cesium 137
22 Curies of carbon 14
2.5 Curies of strontium 90
6 Curies of nickel 63
305 Curies of hydrogen 3
202 Millicuries of polonium 210
10.2 Curies of americium 241
10,100 Curies of cobalt 60

The largest sources of radiation are attributed to two gamma irradiators containing sealed cobalt 60, and the remainder are limited to small sealed radiation sources used in gas chromatography detectors and biological research tritium foils for use in a neutron generator and in instrument development, a sealed radiography source, and calibration sources.

Radioactive material is used under the supervision of individuals designated by the licensee's radiation control committee and, according to license, Army and Federal regulatory requirements. Other protective measures include bioassays and water monitoring. No radioactive waste is incinerated or dumped into storm sewers, sanitary sewers, lakes, or streams. All radioactive waste from Edgewood Arsenal is packaged and transported to a commercial land burial site for disposal.

3. Water Factors.

At Edgewood Arsenal, about half of the manufacturing and waste resources are connected to storm sewers which empty into local creeks and rivers (table 16).

Table 15. Air Emissions from Laboratory and Manufacturing Operations

Building No.	Type of operation	Type of discharge	Annual amount	Frequency of discharge	Treatment
3100	Biomedical research	Vapor of inorganic and organic laboratory liquids		Intermittent	CB filters on hoods
3300		Toxic agents		Continuous	CB filters on hoods
E3330 E3160 E3220	Chemical and biomedical research	Vapors of solvents, chemicals, and agents		Continuous	With and without CB filter for agents
E3220 E3222 E3266	Toxicological research	Vapor of solvents, soluble chemicals	Unknown	Variable	CB filters
E3516	Manufacturing (machine shop)	Plating and cleaning tanks			None
		Paint spray	Varies	Intermittent	Through filter probably not efficient
E3640		Vapors of solvents and gases		Intermittent	Caustic scrubbers; and for toxics, stacks 60 feet above ground
E3560 E3622 E3724 E3726 E3728	Munitions systems research	Vapor of agents, simulants, pyrotechnics, and solvents	Unknown	Intermittent	CB filters for agents
E5282 E5284		Solvents	0.05 gallons per month		None
E5100	Chemical research	Toxic agents in hoods			CB filters
E5158	Degreasing	Mineral spirits	55 gallons per week		
E5185	Shop operation	Plating operation vapor	Amount of vapor unknown	Infrequent	None
	Degreasing	Trichloroethylene fumes from soldering operations (cadmium, silver, copper, zinc)	25 gallons per week 5 pounds per day maximum	Irregular Irregular	None None
		Spray paint Naphtha	Unknown	Irregular	None
E5188	WP research	Crumb, rubber dust, xylene	None at present	None at present	None
E5265	Experimental filling of pyrotechnic smokes and CS	Heptane and acetone	2-3 hours per week		Filters in hoods - 40 stacks, 12 feet high
E5604	Protective mask refurbishing	Charcoal			Unfiltered exhaust

Table 16. Water Emissions from Laboratory and Manufacturing Operations

Building No.	Type of operation	Type of discharge	Amount	Treatment	Ultimate destination
E3157 E3226 E3242 E3245	Veterinary medicine research	Animal wastes Laboratory solvents Sterilized cultures Cleaning solutions	Unknown	Animal wastes, none. Solvents, etc., may enter sanitary sewer.	Kings Creek
E3220 E3222 E3266	Toxicological research	Solvents Cleaning solutions Soluble chemicals Inorganic wastes	Unknown (small amount)	Holding tanks treated with bleach, neutralized, and diluted with water.	Kings Creek
E3330 E3160	Clinical research	Solvents Dyes Reagents Organics Inorganics	50,000 Gallons per day (largely water)	None; some enters sanitary sewer	Kings Creek
E3100 E3300	Biomedical research	Organics Inorganics	Unknown	5,000-gallon holding tank treated with bleach, then dumped	Kings Creek
E3326	Chemical research	Organics Solvents	10 Gallons per month	None	Kings Creek
E3370	Chemical research	Aqueous detergent solution	200 Gallons per month	None	Kings Creek and Wright Creek
E3510	Chemical research	Acetone Hexylene glycol 2-Propanol Inorganics	70 Gallons per week	None	Kings Creek and Wright Creek
E3516	Manufacturing (machine shop)	Plating solutions Oil Solvents	300 Gallons per month	Rinse water drained into storm sewer	Kings Creek
E3566	Explosion test chamber	Liquid washdown Organics Inorganics	50 Gallons per month	Stored and treated in holding tank, then released	Wright Creek
E3560 E3622 E3724 E3726 E3728	Munitions systems research	Solvents Neutralized agents' wastes Inorganic wastes	12,000 Gallons per month (mostly water)	Placed in holding tank, adjusted to pH 5 and then dumped	Kings Creek

Table 16. (Continued)

Building No.	Type of operation	Type of discharge	Amount	Treatment	Ultimate destination
E3640	Chemical research	Organics Inorganics (especially NaOH)	40 Gallons per month	None	Kings Creek
E5032	Chemical research	Inorganics	100 Gallons per month	None	Canal Creek
E5109	Chemical research	Solvents Chemicals Detergents Wash solutions	Unknown but small	None	Canal Creek
E5103	Technical support of research operations	Dyes Bleach Stop bath Cyanides	15 Gallons per day	None	Canal Creek
E5185	Limited manufacturing and plating shop	Chromic acid Metallic salts Organics	165 Gallons per month	1,000-gallon holding tank with limestone chips	Canal Creek
E5265	Experimental filling of pyrotechnics	Colored smokes Powders Organics Inorganics	130 Gallons per month including wash water	None	Canal Creek
E5625	Pilot Plant research	Detoxified agents Heavy metals Organics (phosphates, sulfates)	4,000 Gallons per week (mostly water)	pH adjusted to 7-8 with H_2SO_4	Canal Creek

The Commander of Edgewood Arsenal, in recognition of the potential problem, has ordered the Safety Office and the Ecological Research Office, Biomedical Laboratory, to conduct surveys in Canal Creek and Kings Creek to determine the effect these emissions might have on the local aquatic environment.

Two methods of handling these wastes are being considered. The first is to connect most of these sources to a single industrial-type sewage plant capable of handling 50 to 80,000 gpd. The second proposal is to incinerate all or part of the wastes.

As an intermediate measure, the Pilot Plant, building E5625, was connected to the sanitary sewer system in FY75.

G. Miscellaneous and Nuisance Considerations.

1. Transportation-Related Emissions.

There is one airfield at Edgewood Arsenal, Weide Army Airfield, which can accommodate fixed-wing craft as large as the twin-engined U-21. There are on an average 250 takeoffs and landings per month of which about 95% are rotary-wing aircraft. As indicated in table 17, these activities represent a very small proportion of the emissions generated by mobile sources at Edgewood Arsenal.

Table 17. Approximate Annual Vehicular Emission Levels in Pounds

Vehicle	Particulates	Sulfur oxides	Carbon monoxide	Hydrocarbons	Nitrogen oxides	Aldehydes
Aircraft[a]						
Fixed-wing	3	2	1,760	58	7	
Rotary-wing	714	514	16,300	1,480	1,630	
Boats						
Inboard engine[b]	10,300	26,900	28,700	20,600	31,200	1,600
Outboard engine[c]		32	16,500	5,600	33	
Motor vehicles						
Highway[d]	15,300	5,280	1,640,000	224,000	142,000	
Heavy-duty diesel-powered[e]			Insignificant			
TOTALS	26,317	32,726	1,701,500	251,680	175,870	1,600

[a] Annual number of takeoff and landing cycles times appropriate emission factors in table 3.2.1-3 of Compilation of Air Pollution Emission Factors, AP-42. Environmental Protection Agency, April 1973 (EPA AP-42).

[b] Average of 25 days' use per year per vessel times emission factors in table 3.2.3-2 of EPA AP-42.

[c] Average of 500 horsepower-hours per boat per year times emission factors in table 3.2.4-1 of EPA AP-42.

[d] 21.8 miles per day per car at Edgewood Arsenal times 250 working days per year times appropriate emission factor in table 3.1.1.1 of EPA AP-42.

[e] 10 miles per day per vehicle times 200 working days per year times appropriate emission factor in table 2.1.4 of EPA AP-42.

Marine operations at Edgewood Arsenal consist of the Gunpowder Boat Club and the Recreation Services Division Boat Dock (table 18).

Table 18. Recreational Marine Operations

Type	No.	Operator
Power >30-ft	6	Gunpowder Boat Club
20-30 ft	20	Gunpowder Boat Club
<20-ft	55	Gunpowder Boat Club
Sail	5	Recreation Services Division
	25	Gunpowder Boat Club

Approximately 25% of the powerboats and 50% of the sailboats are equipped with toilets and are therefore potential sources of water pollution. Some fuel and oil spills occur at the docks; however, no estimate as to quantity is available.

In 1972, there were 4,492 motor vehicles registered for on-post use. The daily average number of vehicles on-post is 2200. Approximately 10% of the employees live on post, 50% live within 5 miles, 35% live within 25 miles, and 5% live at a distance greater than 25 miles.

These data are not, of themselves, meaningful. Their usefulness lies in that they provide baseline information upon which future changes in operation may be judged.

2. Odors.

Other than noxious odors which apparently arise from buried munitions and pervade the vicinity of "O" Field in the heat of the summer, there are no known or reported odor problems at Edgewood Arsenal.

3. Water Emissions.

The two swimming pools at Edgewood Arsenal (figure 14) are emptied once a year. The Officers' Club Pool empties into the storm drainage system and the Recreation Services Division Pool empties into the sanitary sewer system (table 19). The water is maintained at pH 4 to 7 by the regular addition of calcium hypochlorite.

In addition to the annual emptying, an average of 2,000 gallons per day per pool is discharged from overflow and the backwash of the filters and enters the sanitary sewer system.

There are five washing operations at Edgewood Arsenal: building E7542 has a test vehicle wash rack; the main motor pool, the barracks, and building E5352 have vehicle wash racks, and Weide Army Airfield has an aircraft wash pad. Some of the motor vehicle washing areas are equipped with sediment traps and oil separation chambers. The Post Exchange service station does not have a vehicle washing facility and the floor drains in the gas station are equipped with an oil separation chamber.

Table 19. Water Usage for Swimming Pools

Pool	Annual water use	Receiving body
	gallons	
Recreation Services Division Pool	2.5×10^6	Bush River (via sanitary sewer)
Officers' Club Pool	2.5×10^6	Canal Creek

The wash water from all the garbage-can cleaning racks enters the sanitary sewer.

Edgewood Arsenal operates a laundry in building E5483 for the decontamination of clothing. The wash water is a bleach, detergent, methyl alcohol, sodium hydroxide, sodium silicafluoride, and sodium acid fluoride solution. The wash water is discharged into the sanitary sewer.

4. Noise Factors.

The only significant noise factor on APG-Edgewood Area, other than that which may occasionally be associated with road repairs, is the airport.

The airport is lightly used by fixed-wing craft and handles predominantly National Guard rotorcraft. There are about 250 takeoffs and landings per month (95% rotorcraft). The largest fixed-wing craft to make regular use of the airport is a U-21 twin-engined plane and the largest rotorcraft is a UH-1. The operational floor imposed on rotorcraft is 1500 feet and noise is a problem with rotorcraft only below 500 feet (see APG's IEA for more details).

The miscellaneous pollution sources at Edgewood Arsenal, with the exception of transportation-related air emissions, are minor and have an environmental effect only on the area immediately adjacent to the source. Edgewood Arsenal operations do not exceed 70 db at the arsenal's boundary.

H. Test Ranges/Sites.

The greater portion (70% to 75%) of Edgewood Arsenal is composed of test ranges or impact areas. Vast areas of both land and water have been used to test artillery, small arms, agents, and equipment since about 1918. Early records are scanty in detail or totally absent. As such, the data presented in this section are rather generalized and are presented by type of materiel rather than by area. Materiel Testing Directorate, Range Control Unit, is responsible for controlling and coordinating firing on Aberdeen Proving Ground. The locations of the test ranges discussed may be found in figure 17.

1. Agents (Including Lethal, Riot, and Incapacitating Agents).

Lethal agents have not been tested in the open air at Edgewood Arsenal for over 4 years, and the last testing of incapacitating agents was completed over 2 years ago. Those areas where testing has been conducted were discussed previously (section V, E).

Agent simulants, riot control agents, and smokes are currently tested on "M" Field, Gunpowder Neck. The program is intermittent and the quantities released are relatively small. There appears to be no significant environmental impact from these operations.

Continuing ecological surveys have been conducted by the Ecological Research Office, Edgewood Arsenal, since late 1969. The primary area of study has been Carroll Island where extensive agent testing has been conducted. The surveys to date confirm the belief that no irreversible damage to the environment has occurred.

2. **Conventional Munitions.**

The test fields south of the fence line at Edgewood Arsenal are extensively used for testing conventional munitions. The configurations include live rounds with HE warheads, inert rounds, and semi-inert rounds (live fuze with inert burster, inert fuze with live burster, etc.). Table 20 gives a summary of test operations including those planned for the near future.

Table 20. Conventional Munition Testing at Edgewood Arsenal

Firing position	Impact area	Munitions tested	Frequency of testing*
"C" Field	"C" Field Bush River	2.75 to 5-inch HUAR 2.7-inch Rockets; inert and HE	(3 days per week)
"L" Field	Rocket sled	Rocket engines	2 days per month
"G" Field	"N" Field	Mortars 60-mm 81-mm 4.2-inch; inert and HE	(3 days per week)
"M" Field	"M" Field	Pyrotechnics and smokes	25 to 30 days per month
"H" Field	"D" Field "E" Field Bush River	Tank and automotive mounted weapons, 20-mm → 152-mm tank gun; inert some 20-mm HE	15 days per month
"I" Field	"I" Field	Vertical fire recovery range 57-mm → 8-inch semi-inert	Varies
APG-AA	"I" Field	57-mm → 8-inch semi-inert	Varies

*Data in parentheses refer to frequency of testing projected for the future.

There are about 5,000 acres on Gunpowder Neck used from time to time as munition test sites. Of this area, "M" Field is the site of frequent fires occasioned by WP and other pyrotechnics tested there. "I" Field receives regular discing to facilitate the location of impacting rounds. This had been a serious source of siltation until silt catch basins were constructed along the water's edge.

The overall environmental effect of these operations would appear to be severe. However, testing at Edgewood Arsenal has been continuous since about 1918 and it is logical to believe that the flora and fauna are in equilibrium with the Army's use of the environment. The continuation of operations at past levels is therefore unlikely to cause any further damage to the area biota.

I. Pest Control Measures.

The pest control program is administered by the entomologist, Facilities Engineering Directorate, Aberdeen Proving Ground.

Facilities Engineering Directorate does not have records available to distinguish control measures performed for the various tenant activities but data listed according to building and area are available. A complete discussion of pesticides used on Aberdeen Proving Ground may be found in the APG-IEA.

J. Storage Areas.

The materiel stored at Edgewood Arsenal includes, in addition to equipment and general supplies, munitions, pyrotechnics, and chemical agents. There are four major storage areas for munitions and agents (figure 18). The Igloo Area (presently empty) and the Goat Yard are used to store munitions; the bunkers are sod-covered to reduce erosion.

The Chemical Agent Storage Yard and the "Y" Area are located along Bush River. The Chemical Agent Storage Yard covers approximately 3 acres and houses 1-ton containers of agents. The containers are not protected from the weather but are inspected on a regular basis. In addition, biological indicators, pigeons and rabbits, are housed throughout the yard and are constantly monitored for signs of agent intoxication.

Radioactive wastes from all of Edgewood Arsenal are held in building E2362 within the "Y" Area until a truckload is accumulated; they are then removed to a commercial land burial site licensed by the Nuclear Regulatory Commission or Agreement state.

The storage of agents and radioactive material at Edgewood Arsenal appears to be environmentally sound.

Petroleum products are stored in 12,000-gallon, above-ground, diesel oil tanks at two major sites, buildings E5259 and E5260. The tanks are diked for 100% containment in the event of a spill and are equipped with evaporation locks.

All other material is stored in warehouses and sheds and does not appear to have significant environmental ramifications.

An environmental assessment has been prepared on the Chemical Agent Storage Yard by Mission Support Division, Technical Support Directorate, which is responsible for storage areas.

K. Resource Management Plans.

Resource management planning for Edgewood Arsenal is the responsibility of Facilities Engineering Directorate, Aberdeen Proving Ground, and a full discussion of management practices may be found in the APG IEA.

VI. CONCLUSIONS.

Past and continued testing of weapons and munitions on Edgewood Arsenal has created small, disturbed, and potentially dangerous areas on Gunpowder Neck and on adjacent Government-owned islands. At the same time, the security practices and the use of buffer areas have created large areas of undisturbed habitat in the midst of the New York-Washington corridor Gunpowder Neck is one of the last large tracts of nearly pristine land on the western shore of the Chesapeake Bay.

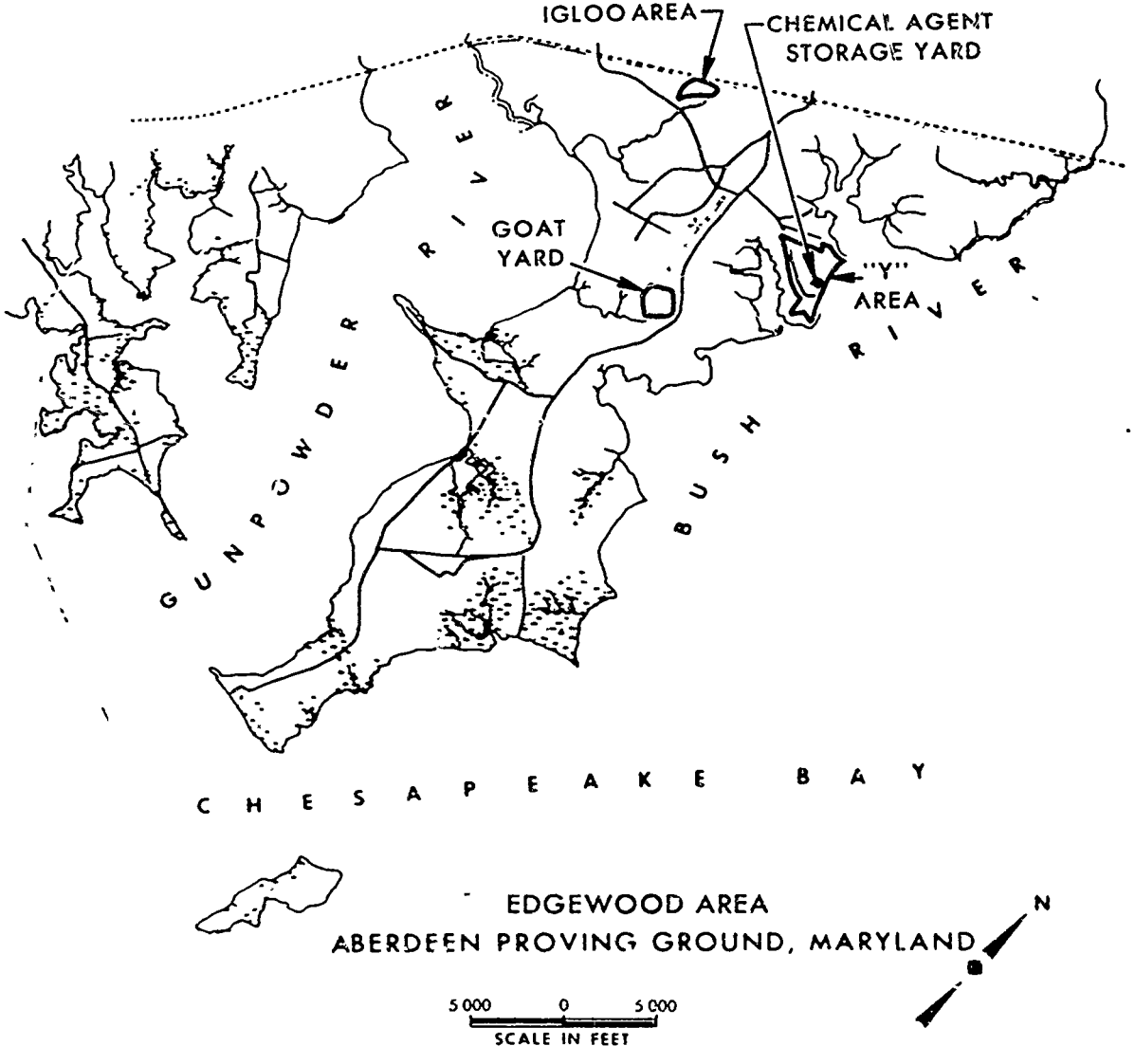


Figure 18. Major Storage Areas

Threats to the continued existence of this desirable circumstance are increasing. Rapidly expanding industrial and residential communities in Harford and Baltimore counties impact adversely on the air and water quality and make an enlightened approach to effluent management of arsenal operations even more timely.

The wastes from arsenal operations, although relatively small in quantity, pose unique problems which require special consideration. The positive command attitude which exists toward solution of these problems is laudable.

Among the recent achievements are: the closing of the landfill which leaches into Canal Creek (although revegetation is still to be accomplished); proposed and implemented changes in thermal decomposition techniques from open-burning and low-temperature incinerators to new high-efficiency incinerators; and connection of several direct outfalls to sewage treatment plant lines.

Other significant problems remain to be solved. These include the decontamination and restoration of old "O" Field, proper treatment of a number of chemical sewage wastes, and full control of chemical vapor exhausts.

Land use at Edgewood Arsenal has reached a state of dynamic equilibrium. Restricted areas buffering test and disposal sites have effectively reserved several known fossil, prehistoric-Indian, and Colonial sites, as well as wide tracts of valuable woodlands and wetlands. Even within the areas of active operations, it is probable that the biota have reached a neo-climax state that is in balance with these operations, which have been relatively constant for more than 20 years.

Within the constraints of its mission and command area of responsibility, Edgewood Arsenal should be able to accelerate a program of environmental protection and enhancement. Such a policy is especially vital in view of Edgewood Arsenal's unique ecological situation.

VII. AGENCIES AND INDIVIDUALS CONTACTED.

1. The Adjutant's Office, APG-Edgewood Area, extension 3114.

2. Mr. Thomas W. Alexander, Administrative Specialist, Facilities Engineering Directorate, APG-Aberdeen Area.

3. Baltimore County Soil Conservation District, Baltimore, Maryland, 666-1188.

4. Mr. Tyler Bastian, Director of Archeology, Maryland Geological Survey, Johns Hopkins University, Baltimore, Maryland, 235-0771.

5. Mr. David Baur, Civil Engineer, Facilities Engineering Directorate, APG-Aberdeen Area, extension 4213.

6. Mr. Gary L. Boettcher, Utilities Division, Facilities Engineering Directorate, APG-Aberdeen Area, extension 2196.

7. Mr. Norman C. Bradfield, Security Office, APG-Edgewood Area, extension 3901.

8 Mr Balfred Brinegar, Program Analyst, Logistics Directorate, APG-Aberdeen Area, extension 4060.

9. SGM James E. Bush, US Army Technical Escort Center, APG-Edgewood Area, extension 3601.

10. Mr. John H. Conley, Manufacturing Technology Directorate, APG-Aberdeen Area, extension 4546.

11. Mr. James R. Cooper, Test and Evaluation Command Historian, APG-Aberdeen Area, extension 2476.

12. Mr. Paul Cresthull, Archeologist, Hookers Mill Road, Abingdon, Maryland, 676-7828.

13. Mr. Sherman L. Davis, Historian, APG-Edgewood Arsenal, extension 2721.

14. Mr. Tom Davis, Chief, Force Development Office, APG-Edgewood Area, extension 3137.

15. Mr. Robert Dean, Chief, Material Accounts Branch, Mission Support Division, Technical Support Directorate, APG-Edgewood Area, extension 3150.

16. Mr. Harold Deel, Chief, Utilities Division, Facilities Engineering Directorate. APG-Aberdeen Area, e tension 2363.

17. Miss Marie Demek, Dr. Emory Sarver, and Dr. Harold Sommer, Decontamination Branch, Environmental Research Division, Chemical Laboratory, APG-Edgewood Area, extenison 3719.

18. Mr. Dean Dickie, Demilitarization/Disposal Office, APG-Edgewood Area, extension 2035.

19. CPT Ronald Eaton, Weide Army Airfield, APG-Edgewood Area, extension 3563.

20. Mr. Eugene R. Ekblad, Executive Director, Harford County Economic Development Commission, Bel Air, Maryland, 838-6000, extension 254.

21. Information Office, APG-Edgewood Area.

22. Mr. Phillip M. Edwards, Safety Office, APG-Edgewood Area, extension 4411.

23. MAJ David G. Fairchild, Biomedical Laboratory, APG-Edgewood Area, extension 3238.

24. Mr. Richard Fletcher, Mechanical Engineer, Facilities Engineering Directorate, APG-Aberdeen Area, extension 4009.

25. Mr. Stanley Fowler, Manager, Bel Air Office of Water Quality, Bel Air, Maryland.

26. Mr. Wojoech F. Gransky, Facilities Engineering Directorate, APG-Aberdeen Area, extension 4880.

27. Mr. John T. Gray, Motor Pool, APG-Aberdeen Area, extension 3191.

28. Mr. Mike Grundy, Safety Office, APG-Aberdeen Area, extension 3898.

29. Mr. James Handshoe, Harford County Department of Health, Bel Air, Maryland, 838-6000, extension 217.

30. Mr. Ammon (Ray) Hartman, Chief, Facilities Resources Analysis Office, Technical Support Directorate, APG-Edgewood Area, extension 2062.

31. Mr. Steven Hill, Safety Office, APG-Edgewood Area, extension 4412.

32. Mr. Allen Hilsmeier, Environmental Coordinator, Office of Technical Director, APG-Edgewood Area, extension 3133.

33. Mr. Elmer Horn, Ammunition Storage Branch, Logistics Directorate, APG-Aberdeen Area, extension 3530.

34. CPT Zella Hubbard, Chief, Health and Environment, APG-Aberdeen Area, extension 4975.

35. Mr. Sigmund Gast, Comptroller Office, APG-Aberdeen Area, extension 5111.

36. Mr. Max Kerschensteiner, Demilitarization/Disposal Office, APG-Edgewood Area, extension 4102.

37. CPT Dale Lonsford, Post Veterinarian, APG-Aberdeen Area, extension 4575.

38. LTC Monroe Manning, Commander, Army Communications Command Detachment, APG-Aberdeen Area, extension 4696.

39. SGT Charles Marlowe, Marine Security Section, Provost Marshal's Division, APG-Aberdeen Area, extension 4863.

40. Mr. Harry Mencke, Intelligence Office, Intelligence Division, Security Office, APG-Aberdeen Area, extension 4194.

41 Mr. Ezechiel H. McCurry, Facilities Engineering Directorate, APG-Aberdeen Area, extension 3693.

42. Mr. Vincent C. Nibali, Procurement Directorate, APG-Aberdeen Area, extension 3497.

43. Mr. Daniel Petrucci, Post Exchange, APG-Aberdeen Area, extension 2303.

44. Mr. Charles Montgomery, Chief, Automotive and Armor Division, Manufacturing Technology Directorate, APG-Aberdeen Area, extension 4277.

45. Mr. W. M. Peel, Baltimore Gas and Electric Company, Baltimore, Maryland, 265-7500.

46 Mr. William R. Reedy, Entomology and Custodial Branch, Facilities Engineering Directorate, APG-Aberdeen Area, extension 3303.

47. MAJ Charles D. Sexton, Phillips Army Airfield, APG-Aberdeen Area, extension 4187.

48. Mrs. Bonnie Sheffler, Housing Office, APG-Aberdeen Area, extension 3347.

49. Mr. Roger Post, Chief, Civil Engineer, APG-Aberdeen Area, extension 4213.

50. Mr. Daniel B. Smith, Fire Chief, APG-Aberdeen Area.

51. Mr. Marvin O. Sutor, Sr., Archeologist, 929 Wakefield Drive, Havre de Grace, Maryland.

52. Mr. Charles D. Solloway, Small Business Office, APG-Edgewood Area, extension 2309.

53 Mr Thomas S Swartz, Administrative Officer, Facilities Engineering Directorate, APG-Aberdeen Area, extension 2521.

54 Mr. F R Thomas, Chief, Utilities Division, Facilities Engineering Directorate, APG-Aberdeen Area.

55. Mr. Franklin E. Vest, Utilities Division, Facilities Engineering Directorate, AFG-Aberdeen Area, extension 4982.

56. Mr. Leland O. Vaughan, Services Division, Logistics Directorate, APG-Aberdeen Area, extension 3141.

57. Mr. Dwight O. Wagoner, Utilities Division, Facilities Engineering Directorate, APG-Aberdeen Area, extension 4982.

58. Mr. Leonard C. Weston, US Army Test and Evaluation Command, Aberdeen Proving Ground, Maryland, extension 2476.

59. Mr. Paul W. Wirtz, Environmental Coordinator, Facilities Engineering Directorate, APG-Aberdeen Area, extension 5236.

60. Mr. Larry Taylor, Refrigeration Section, Facilities Engineering Directorate, APG-Aberdeen Area, extension 3605.

61. Mr. Richard Worobec, Water and Sewers Division of Public Works, Harford County, Bel Air, Maryland, 838-6000, extension 272.

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APPENDIX A

SPECIES LISTS, ANIMAL AND PLANT KINGDOMS

SPECIES, ANIMAL KINGDOM

1. Mammals.

	Scientific name	Common name	Occurrence
1.	*Didelphis marsupialis virginiana*	Opossum	Common
2.	*Sorex cinereus fontinalis*	Masked shrew	Uncommon
3.	*Cryptotis parva parva*	Least shrew	Rare
4.	*Blarina brevicauda kirtlandi*	Short-tailed shrew	Common
5.	*Condylura cristata cristata*	Star-nosed mole	Rare
6.	*Scalopus aquaticus aquaticus*	Eastern mole	Rare
7.	Various species	Bats	Uncommon
8.	*Procyon lotor lotor*	Raccoon	Common
9.	*Mustela erminea cicognanii*	Short-tailed weasel or ermine	Rare
10.	*Lutra canadensis lataxina*	River otter	Rare
11.	*Mephitis mephitis nigra*	Striped skunk	Common
12.	*Vulpes vulpes fulva*	Red fox	Common
13.	*Urocyon cinereoargenteus cinereoargenteus*	Gray fox	Rare
14.	*Marmota monax monax*	Woodchuck	Common
15.	*Tamias striatus fisheri*	Eastern chipmunk	Common
16.	*Sciurus niger vulpinus*	Eastern fox squirrel	Common
17.	*Sciurus carolinensis pennsylvanicus*	Eastern gray squirrel	Common
18.	*Glaucomys volans volans*	Southern flying squirrel	Uncommon
19.	*Castor canadensis*	Beaver	Uncommon
20.	*Peromyscus leucopus noveboracensis*	White-footed mouse	Abundant
21.	*Neotoma floridana magister*	Eastern woodrat	Rare
22.	*Oryzomys palustris palustris*	Rice rat	Uncommon
23.	*Microtus pennsylvanicus pennsylvanicus*	Meadow vole	Abundant
24.	*Pitymys pinetorum scalopsoides*	Pine vole	Uncommon
25.	*Ondatra zibethicus macrodon*	Muskrat	Abundant
26	*Zapus hudsonius americanus*	Meadow jumping mouse	Common
27.	*Rattus norvegicus*	Norway rat	Rare
28.	*Mus musculus*	House mouse	Uncommon
29.	*Sylvilagus floridanus mallurus*	Eastern cottontail	Abundant
30.	*Odocoileus virginianus borealis*	White-tailed deer	Abundant

2. Birds.

1.	*Gavia immer*	Common loon
2.	*Podiceps auritus*	Horned grebe
3.	*Podilymbus podiceps*	Pied-billed grebe
4.	*Phalacrocorax auritus*	Double-crested cormorant
5.	*Ardea herodias*	Great blue heron
6.	*Florida caerulea*	Little blue heron
7.	*Bubulcus ibis*	Cattle egret

	Scientific name	Common name
8.	*Casmerodius albus*	Common egret
9.	*Leucophoyx thula*	Snowy egret
10.	*Butorides virescens*	Green heron
11.	*Ixobrychus exilis*	Least bittern
12.	*Botaurus lentiginosus*	American bittern
13.	*Plegadis falcinellus*	Glossy ibis
14.	*Plegadis albus*	White ibis
15.	*Olor columbianus*	Whistling swan
16.	*Branta canadensis*	Canada goose
17.	*Anas platyrhynchos*	Mallard
18.	*Anas rubripes*	Black duck
19.	*Anas strepera*	Gadwall
20.	*Anas acuta*	Pintail
21.	*Anas carolinensis*	Green-winged teal
22.	*Anas discors*	Blue-winged teal
23.	*Mareca americana*	American widgeon
24.	*Spatula clypeata*	Shoveler
25.	*Aix sponsa*	Wood duck
26.	*Aythya americana*	Redhead
27.	*Aythya collaris*	Ring-necked duck
28.	*Aythya valisineria*	Canvasback
29.	*Aythya marila*	Greater scaup
30.	*Bucephala clangula*	Common goldeneye
31.	*Bucephala albeola*	Bufflehead
32.	*Oxyura jamaicensis*	Ruddy duck
33.	*Lophodytes cucullatus*	Hooded merganser
34.	*Mergus merganser*	Common merganser
35.	*Mergus serrator*	Red-breasted merganser
36.	*Cathartes aura*	Turkey vulture
37.	*Coragyps atratus*	Black vulture
38.	*Accipiter striatus*	Sharp-shinned hawk
39.	*Accipiter cooperii*	Cooper's hawk
40.	*Buteo lagopus*	Rough-legged hawk
41.	*Buteo jamaicensis*	Red-tailed hawk
42.	*Buteo lineatus*	Red-shouldered hawk
43.	*Buteo platypterus*	Broad-winged hawk
44.	*Aquila chrysaëtos*	Golden eagle
45.	*Haliaeetus leucocephalus*	Bald eagle
46.	*Circus cyaneus*	Marsh hawk
47.	*Pandion haliaetus*	Osprey
48.	*Falco columbarius*	Pigeon hawk
49.	*Falco sparverius*	Sparrow hawk
50.	*Meleagris gallopavo*	Turkey
51.	*Colinus virginianus*	Bobwhite
52.	*Phasianus colchicus*	Ring-necked pheasant
53.	*Rallus elegans*	King rail
54.	*Rallus limicola*	Virginia rail
55.	*Gallinula chloropus*	Common gallinule
56.	*Porzana carolina*	Sora
57.	*Laterallus jamaicensis*	Black rail

	Scientific name	Common name
58.	*Fulica americana*	American coot
59.	*Charadrius wilsonia*	Wilson's plover
60.	*Charadrius vociferus*	Killdeer
61.	*Squatarola squatarola*	Black-bellied plover
62.	*Philohela minor*	American woodcock
63.	*Capella gallinago*	Common snipe
64.	*Actitis macularia*	Spotted sandpiper
65.	*Tringa solitaria*	Solitary sandpiper
66.	*Catoptrophorus semipalmatus*	Willet
67.	*Totanus melanoleucus*	Greater yellowlegs
68.	*Totanus flavipes*	Lesser yellowlegs
69.	*Erolia melanotos*	Pectoral sandpiper
70.	*Erolia minutilla*	Least sandpiper
71.	*Erolia alpina*	Dunlin
72.	*Limnodromus griseus*	Dowitcher
73.	*Ereunetes pusillus*	Semipalmated sandpiper
74.	*Larus marinus*	Great black-backed gull
75.	*Larus argentatus*	Herring gull
76.	*Larus delawarensis*	Ring-billed gull
77.	*Larus atricilla*	Laughing gull
78.	*Larus philadelphia*	Bonaparte's gull
79.	*Sterna albifrons*	Least tern
80.	*Hydroprogne caspia*	Caspian tern
81.	*Columba livia*	Rock dove
82.	*Zenaidura macroura*	Mourning dove
83.	*Coccyzus americanus*	Yellow-billed cuckoo
84.	*Bubo virginianus*	Great horned owl
85.	*Asio flammeus*	Short-eared owl
86.	*Tyto alba*	Barn owl
87.	*Strix varia*	Barred owl
88.	*Caprimulgus carolinensis*	Chuck-will's widow
89.	*Caprimulgus vociferus*	Whippoorwill
90.	*Chaetura pelagica*	Chimney swift
91.	*Archilochus colubris*	Ruby-throated hummingbird
92.	*Megaceryle alcyon*	Belted kingfisher
93.	*Colaptes auratus*	Yellow-shafted flicker
94.	*Sphyrapicus varius*	Yellow-bellied sapsucker
95.	*Centurus carolinus*	Red-bellied woodpecker
96.	*Dendrocopos villosus*	Hairy woodpecker
97.	*Dendrocopos pubescens*	Downy woodpecker
98.	*Tyrannus tyrannus*	Eastern kingbird
99.	*Myiarchus crinitus*	Great crested flycatcher
100.	*Sayornis phoebe*	Eastern phoebe
101.	*Empidonax virescens*	Acadian flycatcher
102.	*Contopus virens*	Eastern wood pewee
103.	*Nuttallornis borealis*	Olive-sided flycatcher
104.	*Eremophila alpestris*	Horned lark
105.	*Iridoprocne bicolor*	Tree swallow
106.	*Riparia riparia*	Bank swallow
107.	*Stelgidopteryx ruficollis*	Rough-winged swallow

	Scientific name	Common name
108.	*Hirundo rustica*	Barn swallow
109.	*Progne subis*	Purple martin
110.	*Cyanocitta cristata*	Blue jay
111.	*Corvus brachyrhynchos*	Common crow
112.	*Corvus ossifragus*	Fish crow
113.	*Parus carolinensis*	Carolina chickadee
114.	*Parus bicolor*	Tufted titmouse
115.	*Sitta carolinensis*	White-breasted nuthatch
116.	*Certhia familiaris*	Brown creeper
117.	*Troglodytes troglodytes*	Winter wren
118.	*Thryothorus ludovicianus*	Carolina wren
119.	*Telmatodytes palustris*	Long-billed marsh wren
120.	*Mimus polyglottos*	Mockingbird
121.	*Dumetella carolinensis*	Catbird
122.	*Toxostoma rufum*	Brown thrasher
123.	*Turdus migratorius*	Robin
124.	*Hylocichla mustelina*	Wood thrush
125.	*Hylocichla guttata*	Hermit thrush
126.	*Hylocichla ustulata*	Swainson's thrush
127.	*Hylocichla fuscescens*	Veery
128.	*Sialia sialis*	Eastern bluebird
129.	*Polioptila caerulea*	Blue-gray gnatcatcher
130.	*Regulus satrapa*	Golden-crowned kinglet
131.	*Regulus calendula*	Ruby-crowned kinglet
132.	*Bombycilla cedrorum*	Cedar waxwing
133.	*Sturnus vulgaris*	Starling
134.	*Vireo griseus*	White-eyed vireo
135.	*Vireo olivaceus*	Red-eyed vireo
136.	*Mniotilta varia*	Black-and-white warbler
137.	*Vermivora pinus*	Blue-winged warbler
138.	*Vermivora peregrina*	Tennessee warbler
139.	*Parula americana*	Parula warbler
140.	*Dendroica petechia*	Yellow warbler
141.	*Dentroica magnolia*	Magnolia warbler
142.	*Dendroica tigrina*	Cape May warbler
143.	*Dendroica caerulescens*	Black-throated blue warbler
144.	*Dendroica coronata*	Myrtle warbler
145.	*Dendroica virens*	Black-throated green warbler
146.	*Dendroica fusca*	Blackburnian warbler
147.	*Dendroica pensylvanica*	Chestnut-sided warbler
148.	*Dendroica castanea*	Bay-breasted warbler
149.	*Dendroica striata*	Blackpoll warbler
150.	*Dendroica pinus*	Pine warbler
151.	*Dendroica discolor*	Prairie warbler
152.	*Dendroica palmarum*	Palm warbler
153.	*Seiurus aurocapillus*	Ovenbird
154.	*Seiurus noveboracensis*	Northern waterthrush
155.	*Seiurus motacilla*	Louisiana waterthrush

	Scientific name	Common name	Occurrence
156.	*Geothlypis trichas*	Yellowthroat	
157.	*Icteria virens*	Yellow-breasted chat	
158.	*Wilsonia pusilla*	Wilson's warbler	
159.	*Wilsonia canadensis*	Canada warbler	
160.	*Setophaga ruticilla*	American redstart	
161.	*Passer domesticus*	House sparrow	
162.	*Dolichonyx oryzivorus*	Bobolink	
163.	*Sturnella magna*	Eastern meadowlark	
164.	*Agelaius phoeniceus*	Red-winged blackbird	
165.	*Icterus spurius*	Orchard oriole	
166.	*Icterus galbula*	Baltimore oriole	
167.	*Euphagus carolinus*	Rusty blackbird	
168.	*Quiscalus quiscula*	Common grackle	
169.	*Molothrus ater*	Brown-headed cowbird	
170.	*Piranga olivacea*	Scarlet tanager	
171.	*Piranga rubra*	Summer tanager	
172.	*Richmondena cardinalis*	Cardinal	
173.	*Pheucticus ludovicianus*	Rose-breasted grosbeak	
174.	*Guiraca caerulea*	Blue grosbeak	
175.	*Passerina cyanea*	Indigo bunting	
176.	*Spinus tristis*	American goldfinch	
177.	*Pipilo erythrophthalmus*	Rufous-sided towhee	
178.	*Passerculus sandwichensis*	Savannah sparrow	
179.	*Ammodramus savannarum*	Grasshopper sparrow	
180.	*Pooecetes gramineus*	Vesper sparrow	
181.	*Junco hyemalis*	Slate-colored junco	
182.	*Spizella arborea*	Tree sparrow	
183.	*Spizella passerina*	Chipping sparrow	
184.	*Spizella pusilla*	Field sparrow	
185.	*Zonotrichia leucophrys*	White-crowned sparrow	
186.	*Zonotrichia albicollis*	White-throated sparrow	
187.	*Passerella iliaca*	Fox sparrow	
188.	*Melospiza georgiana*	Swamp sparrow	
189.	*Melospiza melodia*	Song sparrow	
190.	*Plectrophenax nivalis*	Snow bunting	

3. Amphibians and Reptiles.

1.	*Ambystoma maculatum*	Spotted salamander	Common
2.	*Ambystoma opacum*	Marbled salamander	Uncommon
3.	*Plethodon c. cinereus*	Red-backed salamander	Common
4.	*Bufo a. americanus*	American toad	Common
5.	*Bufo woodhousei fowleri*	Fowler's toad	Abundant
6.	*Acris crepitans crepitans*	Northern cricket frog	Abundant
7.	*Hyla cinerea*	Green treefrog	Uncommon
8.	*Hyla c. crucifer*	Northern spring peeper	Abundant
9.	*Hyla v. versicolor*	Eastern gray treefrog	Abundant
10.	*Pseudacris triseriata feriarum*	Upland chorus frog	Common

	Scientific name	Common name	Occurrence
11.	*Rana catesbeiana*	Bullfrog	Abundant
12.	*Rana clamitans melanota*	Green frog	Abundant
13.	*Rana p. pipiens*	Northern leopard frog	Rare
14.	*Rana p. sphenocephala*	Southern leopard frog	Abundant
15.	*Rana palustris palustris*	Pickeral frog	Uncommon
16.	*Sceloporus undulatus hyacinthinus*	Northern fence lizard	Rare
17.	*Eumeces fasciatus*	Five-lined skink	Common
18.	*Carphophis a. amoenus*	Eastern worm snake	Uncommon
19.	*Diadophis punctatus edwardsi*	Northern ringneck snake	Rare
20.	*Heterodon platyrhinos*	Eastern hognose snake	Rare
21.	*Coluber c. constrictor*	Northern black racer	Common
22.	*Elaphe o. obsoleta*	Black rat snake	Common
23.	*Lampropeltis g. getulus*	Eastern kingsnake	Rare
24.	*Lampropeltis doliata*	Eastern milk snake	Rare
25.	*Natrix s. sipedon*	Northern water snake	Abundant
26.	*Regina s. septemvittata*	Queen snake	Rare
27.	*Thamnophis s. sauritus*	Eastern ribbon snake	Uncommon
28.	*Thamnophis s. sirtalis*	Eastern garter snake	Common
29.	*Kinosternon s. subrubrum*	Eastern mud turtle	Abundant
30.	*Chelydra s. serpentina*	Snapping turtle	Abundant
31.	*Clemmys guttata*	Spotted turtle	Abundant
32.	*Clemmys muhlenbergi*	Bog turtle	Unknown
33.	*Terrapene c. carolina*	Eastern box turtle	Abundant
34.	*Malaclemys t. terrapin*	Northern diamondback terrapin	Abundant
35.	*Chrysemys p. picta*	Eastern painted turtle	Abundant
36.	*Chrysemys rubriventris*	Red-bellied turtle	Rare
37.	*Chrysemys scripta elegans*	Red-eared turtle	Uncommon

4. Fishes.

1.	*Petromyzoa marinus*	Sea lamprey	Uncommon
2.	*Lampetra aepyptera*	Least brook lamprey	Rare
3.	*Amia calva*	Bowfin	Rare
4.	*Anguilla rostrata*	American eel	Common
5.	*Alosa aestivalis*	Blueback herring	Abundant
6.	*Alosa pseudohavengus*	Alewife	Common
7.	*Alosa mediocris*	Hickory shad	Common
8.	*Alosa sapidissima*	American shad	Abundant
9.	*Brevoortia tyrannus*	Atlantic menhaden	Abundant
10.	*Dorosoma cepedianum*	Gizzard shad	Abundant
11.	*Anchoa mitchill*	Bay anchovy	Abundant
12.	*Esox niger*	Chain pickerel	Rare
13.	*Umbra pygmaea*	Eastern mudminnow	Rare
14.	*Carassius auratus*	Goldfish	Rare
15.	*Cyprinius carpio*	Carp	Common
16.	*Notemigonus crysoleucas*	Golden shiner	Common
17.	*Notropis hudsonuis*	Spottail shiner	Abundant
18.	*Rhinichthys atratulus*	Blacknose dace	Common

	Scientific name	Common name	Occurrence
19.	*Hypograthus nuchalis*	Silvery minnow	Unknown
20.	*Notropis amoenus*	Attractive minnow	Unknown
21.	*Erimyzon oblongus*	Creek chubsucker	Common
22.	*Ictalurus catus*	White catfish	Common
23.	*Ictalurus nebulosus*	Brown bullhead	Common
24.	*Ictalurus punctatus*	Channel catfish	Common
25.	*Strongylura marina*	Atlantic needlefish	Common
26.	*Fundulus diaphanus*	Bonded killifish	Common
27.	*Fundulus majalis*	Striped killifish	Common
28.	*Fundulus heteroclitus*	Mummichog	Abundant
29.	*Membras martinica*	Rough silverside	Uncommon
30.	*Menidia beryllina*	Tidewater silverside	Uncommon
31.	*Menidia menidia*	Atlantic silverside	Abundant
32.	*Syngnathus fuscus*	Northern pipefish	Rare
33.	*Morone americana*	White perch	Abundant
34.	*Morone saxatilis*	Striped bass	Abundant
35.	*Lepomis cyanellus*	Green sunfish	Rare
36.	*Lepomis gibbosus*	Pumpkinseed	Abundant
37.	*Lepomis macrochirus*	Bluegill	Uncommon
38.	*Lepomis megalotis*	Longear sunfish	Rare
39.	*Pomoxis annularis*	White crappie	Common
40.	*Pomoxis nigromaculatus*	Black crappie	Common
41.	*Micropterus salmoides*	Largemouth bass	Uncommon
42.	*Micropterus dolemieui*	Smallmouth bass	Rare
43.	*Etheostoma nigrum*	Johnnie darter	Common
44.	*Perca flavescens*	Yellow perch	Common
45.	*Stizostedion vitreum*	Walleye	Rare
46.	*Pomatomus saltatrix*	Bluefish	Rare
47.	*Micropogon undulatus*	Atlantic croaker	Rare
48.	*Leiostomus xanthurus*	Spot	Rare
49.	*Cynoscion nebulosus*	Weakfish	Rare
50.	*Gobiosoma bosci*	Naked goby	Rare
51.	*Trinectes maculatus*	Hogchoker	Common
52.	*Apeltes quadracus*	Four-spined stickleback	Rare

5. Invertebrates.

1.	*Arcella* sp.	Protozoan	Common
2.	*Centropyxis aculeata*	Protozoan	Common
3.	*Coleps* sp.	Protozoan	Common
4.	*Difflugia oblonga*	Protozoan	Common
5.	*Peranema* sp.	Protozoan	Abundant
6.	*Phacus* sp.	Protozoan	Abundant
7.	*Uroleptus* sp.	Protozoan	Abundant
8.	*Chaetonotus* sp.	Gastrotrich	Abundant
9.	*Polymerurus* sp.	Gastrotrich	Common
10.	*Brachionus* sp.	Rotifer	Unknown
11.	*Notholca* sp.	Rotifer	Unknown
12.	*Anuraeopsis* sp.	Rotifer	Unknown
13.	*Cephalodella* sp.	Rotifer	Unknown

	Scientific name	Common name	Occurrence
14.	*Hexarthra* sp.	Rotifer	Unknown
15.	*Lecane* sp.	Rotifer	Unknown
16.	*Lepadella* sp.	Rotifer	Unknown
17.	*Monostyla* sp.	Rotifer	Common
18.	*Philodina* sp.	Rotifer	Common
19.	*Polyarthra* sp.	Rotifer	Unknown
20.	*Trichocera* sp.	Rotifer	Unknown
21.	*Plumatella repens*	Moss animal	Common
22.	*Pristina* sp.	Worm	Unknown
23.	*Stylaria* sp.	Worm	Unknown
24.	*Placobdella rugosa*	Leech	Unknown
25.	*Scolecolepides viridis*	Worm	Abundant
26.	*Hypaniola gravi*	Worm	Common
27.	*Nereis succinea*	Worm	Common
28.	*Polydora ligni*	Worm	Uncommon
29.	*Catinella hubrichti*	Snail	Unknown
30.	*Helicodiscus parallelus*	Snail	Unknown
31.	*Mesodon thyroidus*	Snail	Unknown
32.	*Hygromia striolata*	Snail	Unknown
33.	*Oxychilus alliarius*	Snail	Unknown
34.	*Oxychilus cellarius*	Snail	Unknown
35.	*Philomycus carolinianus*	Snail	Unknown
36.	*Pupoides albilabris*	Snail	Unknown
37.	*Retinella indentata*	Snail	Unknown
38.	*Triodopsis fallax fallax*	Snail	Unknown
39.	*Triodopsis justidens justidens*	Snail	Unknown
40.	*Triodopsis tridentata*	Snail	Unknown
41.	*Ventridens demissus*	Snail	Unknown
42.	*Ventridens suppressus*	Snail	Unknown
43.	*Vertigo pygmaea*	Snail	Unknown
44.	*Zonitoides arboreus*	Snail	Unknown
45.	*Zonitoides nitidus*	Snail	Unknown
46.	*Zoogenetes harpa*	Snail	Unknown
47.	*Amnicola lustrica*	Snail	Unknown
48.	*Melampus bidentatus*	Snail	Unknown
49.	*Planorbula jenksii*	Snail	Unknown
50.	*Odostomia* sp.	Snail	Abundant
51.	*Congeria leucophaeta*	False mussel	Common
52.	*Mya arenaria*	Clam	Rare
53.	*Rangia cuneata*	Clam	Abundant
54.	*Macoma blathica*	Clam	Common
55.	*Illinichernes distinctus*	Pseudoscorpion	Rare
56.	*Microbisium confusum*	Pseudoscorpion	Rare
57.	*Micrathena gracilis*	Spider	Common
58.	*Micrathena sagittata*	Spider	Common
59.	*Verrucosa* sp.	Spider	Common
60.	*Lithobius* spp.	Centipede	Unknown
61.	*Candona* sp.	Fresh water ostracod	Common
62.	*Cypricercus* sp.	Fresh water ostracod	Unknown

	Scientific name	Common name	Occurrence
63.	*Cypridopsis* sp.	Fresh water ostracod	Unknown
64.	*Cyprinotus incongruens*	Fresh water ostracod	Unknown
65.	*Cypris* sp.	Fresh water ostracod	Unknown
66.	*Eucypris reticulata*	Fresh water ostracod	Unknown
67.	*Cyprideis littoralis*	Brackish water shrimp	Unknown
68.	*Cythere* sp.	Brackish water shrimp	Unknown
69.	*Sarsocythere* sp.	Brackish water shrimp	Unknown
70.	*Eurytemora affinis*	Copepod	Common
71.	*Bryocamptus* sp.	Copepod	Common
72.	*Canthocamptus staphylincides*	Copepod	Common
73.	*Cyclops vernalis*	Copepod	Common
74.	*Diaptomus Dirgei*	Copepod	Common
75.	*Diaptomus sanguineus*	Copepod	Common
76.	*Paracyclops fimbriatus poppei*	Copepod	Common
77.	*Tropocyclops prasinus*	Copepod	Common
78.	*Corophium lacustre*	Amphipod	Common
79.	*Crangonyx shoemakeri*	Amphipod	Rare
80.	*Gammarus daiberi*	Amphipod	Rare
81.	*Gammarus tigrinus*	Amphipod	Rare
82	*Gammarus faciatus*	Amphipod	Common
83.	*Leptocheivus plumulosus*	Amphipod	Abundant
84.	*Armadillidium nasutum*	Sow bug	Unknown
85.	*Porcellio scaber*	Sow bug	Unknown
86.	*Porcellio spinicornis*	Sow bug	Unknown
87.	*Metoponothus pruinosus*	Sow bug	Unknown
88.	*Asellus intermedius*	Sow bug	Unknown
89.	*Cirolana concharum*	Sow bug	Unknown
90.	*Chiridotea triloba*	Sow bug	Unknown
91.	*Cyathura polita*	Sow bug	Uncommon
92.	*Edotea triloba*	Sow bug	Unknown
93.	*Paleomonetes pugio*	Crab	Unknown
94.	*Neopanopeus texana texana*	Crab	Common
95.	*Callinectes sapidus*	Crab	Unknown
96.	*Eubranchipus holmani*	Fairy shrimp	Unknown
97.	*Eubranchipus vernalis*	Fairy shrimp	Unknown
98.	*Alona* sp.	Water flea	Unknown
99.	*Alonella* sp.	Water flea	Unknown
100.	*Ceriodaphnia quadrangula*	Water flea	Unknown
101.	*Daphnia catawba*	Water flea	Unknown
102.	*Daphnia laevis*	Water flea	Unknown
103.	*Pleuroxus deuticulatus*	Water flea	Unknown
104.	*Scapholeberis kingi*	Water flea	Unknown
105.	*Simocephalus exspinosus*	Water flea	Unknown
106.	*Simocephalus vetulus*	Water flea	Unknown

SPECIES, PLANT KINGDOM

1. Woody Plants.

	Scientific Name	Common name	Occurrence
1.	*Quercus falcata*	Southern red oak	Abundant
2.	*Quercus borealis*	Northern red oak	Common
3.	*Quercus velutina*	Black oak	Common
4.	*Quercus palustris*	Pin oak	Common
5.	*Quercus phellos*	Willow oak	Abundant
6.	*Quercus prinus*	Chestnut oak	Common
7.	*Quercus coccinea*	Scarlet oak	Common
8.	*Quercus alba*	White oak	Common
9.	*Quercus stellata*	Post oak	Common
10.	*Quercus bicolor*	Swamp white oak	Common
11.	*Quercus velutina x Q. phellos*	Oak	Rare
12.	*Fagus grandifolia*	American beech	Common
13.	*Castanea dentata*	American chestnut	Common
14.	*Ulmus americana*	American elm	Common
15.	*Liquidambar styraciflua*	Sweet gum	Abundant
16.	*Liriondendron tulipifera*	Yellow poplar	Abundant
17.	*Acer saccharinum*	Silver maple	Uncommon
18.	*Acer rubrum*	Red maple	Abundant
19.	*Carya tomentosa*	Mockernut hickory	Uncommon
20.	*Carya cordiformis*	Bitternut hickory	Uncommon
21.	*Carya ovata*	Shagbark hickory	Common
22.	*Carya glabra*	Pignut hickory	Common
23.	*Sassafras albidum*	Sassafras	Common
24.	*Juglans nigra*	Black walnut	Common
25.	*Robinia pseudoacacia*	Black locust	Abundant
26.	*Amelanchier* sp.	Serviceberry	Common
27.	*Ilex opaca*	American holly	Abundant
28.	*Platanus occidentalis*	Sycamore	Common
29.	*Betula nigra*	River birch	Uncommon
30.	*Populus grandidenta*	Bigtooth aspen	Uncommon
31.	*Prunus serotina*	Black cherry	Abundant
32.	*Diospyros virginiana*	Persimmon	Abundant
33.	*Nyssa sylvatica*	Black gum	Abundant
34.	*Salix nigra*	Black willow	Uncommon
35.	*Salix sericea*	Silky willow	Uncommon
36.	*Cornus florida*	Dogwood	Common
37.	*Cornus amomum*	Silky dogwood	Common
38.	*Fraxinus americana*	White ash	Common
39.	*Fraxinus pennsylvanica*	Green ash	Common
40.	*Acer saccharum*	Sugar maple	Common
41.	*Rhus* spp.	Sumac	Abundant
42.	*Morus alba*	White mulberry	Uncommon
43.	*Paulownia tomentosa*	Princess tree	Common
44.	*Pyrus coronaria*	Wild crab apple	Uncommon
45.	*Celtis occidentalis*	Hackberry	Uncommon
46.	*Acer negundo*	Box elder	Uncommon
47.	*Pinus taeda*	Loblolly pine	Common

	Scientific name	Common name	Occurrence
48.	*Pinus* sp.	Pine	Common
49.	*Pinus virginiana*	Scrub or Virginia pine	Common
50.	*Pinus* sp.	Pine	Common
51.	*Pinus strobus*	White pine	Uncommon
52.	*Juniperus virginiana*	Red cedar	Uncommon
53.	*Ilex verticillata*	Winterberry holly	Common
54.	*Clethra alnifolia*	Pepperbush	Common
55.	*Alnus serrulata*	Common alder	Abundant
56	*Lonicera japonica*	Japanese honeysuckle	Abundant
57.	*Smilax rotundifoiia*	Bullbrier	Abundant
58.	*Smilax glauca*	Catbrier	Abundant
59.	*Rubus allegheniensis*	Allegheny blackberry	Common
60.	*Rhododendron nudiflorum*	Pinxterbloom azalea	Abundant
61.	*Gaylussacia baccata*	Common huckleberry	Abundant
62.	*Kalmia latifolia*	Mountain laurel	Common
63.	*Lindera benzoin*	Spice bush	Common
64.	*Hamamelis virginiana*	Witch hazel	Uncommon
65.	*Vaccinium atrococcum*	Black highbush blueberry	Abundant
66.	*Vaccinium corymbosum*	Common highbush blueberry	Abundant
67.	*Vaccinium vacillans*	Early low blueberry	Common
68.	*Vaccinium stamineum*	Deerberry	Uncommon
69.	*Mitchella repens*	Partridge berry	Uncommon
70.	*Toxicodendron radicans*	Poison ivy	Common
71.	*Corylus americana*	American hazel	Common
72.	*Corylus* sp.	Hazel	Planted
73.	*Cephalanthus occidentalis*	Buttonbush	Uncommon
74.	*Baccharis halimifolia*	Groundseltree	Abundant
75.	*Amelanchier canadensis*	Oblong-leaf shadbush	Abundant
76.	*Amelanchier* sp.	Shadbush	Uncommon
77.	*Viburnum dentatum*	Southern arrow-wood	Common
78.	*Viburnum prunifolium*	Blackhaw viburnum	Abundant
79.	*Vitis aestivalis*	Summer grape	Common
80.	*Vitis labrusca*	Northern fox grape	Uncommon
81.	*Vitis riparia*	River bank grape	Common
82.	*Amorpha fruticosa*	Leadplant	Uncommon
83.	*Ascyrum hypericoides*	St. Andrew's cross	Common
84.	*Aralia spinosa*	Hercules club	Uncommon
85.	*Aronia arbutifolia*	Red chokeberry	Common
86.	*Campsis radicans*	Trumpet creeper	Common
87.	*Crataegus* spp.	Hawthorn	Uncommon
88.	*Leucothoe racemosa*	Leucothoe	Uncommon
89.	*Lyonia mariana*	Staggerbush	Uncommon
90.	*Lyonia ligustrina*	Maleberry	Common
91.	*Parthenocissus quinquefolia*	Virginia creeper	Common
92.	*Rosa multiflora*	Many-flowered rose	Uncommon
93.	*Rosa palustris*	Marsh rose	Common
94.	*Rubus* sp.	Blackberry	Abundant
95.	*Sambucus canadensis*	Common elder	Common
2.	Herbaceous Plants.		
96.	*Agropyrum repens*	Quackgrass	Common
97.	*Cynodon dactylon*	Bermuda grass	Uncommon

	Scientific name	Common name	Occurrence
98.	*Digitaria sanguinalis*	Common crabgrass	Abundant
99.	*Eleusine indica*	Goosegrass	Common
100.	*Muhlenbergia shreberi*	Nimblewill grass	Common
101.	*Poa compressa*	Canada bluegrass	Common
102.	*Poa pratensis*	Kentucky bluegrass	Abundant
103.	*Setaria glauca*	Yellow bristlegrass	Abundant
104.	*Trifolium repens*	White clover	Common
105.	*Amaranthus retroflexus*	Pigweed	Rare
106.	*Ambrosia artemisiifolia*	Common ragweed	Common
107.	*Andropogon virginicus*	Broom-sedge berdgrass	Common
108.	*Bromus secalinus*	Cheat	Common
109.	*Chenopodium album*	Lamb's-quarters	Common
110.	*Echinochloa crusgalli*	Barnyard grass	Uncommon
111.	*Lepidium campestre*	Field peppergrass	Common
112.	*Lespedeza striata*	Common lespedeza	Uncommon
113.	*Melilotus alba*	White sweet clover	Common
114.	*Panicum dichotomiflorum*	Forking panic grass	Common
115.	*Phytolacca americana*	Pokeweed	Uncommon
116.	*Tridens flavus*	Purpletop	Common
117.	*Sorghum halepense*	Johnson grass	Uncommon

3. Algae.

1.	*Agmenellum quadriduplicatum*	Blue green algae	Unknown
2.	*Anabena circinalis* var. *macrospora*	Blue green algae	Unknown
3.	*Lyngbya limnetica* Lemmermann	Blue green algae	Unknown
4.	*Actinastrum gracilum*	Green algae	Unknown
5.	*Actinastrum hantzschii*	Green algae	Unknown
6.	*Ankistrodesmus falcatus*	Green algae	Unknown
7.	*Chodatella Chodati*	Green algae	Unknown
8.	*Closterium moniliforme*	Green algae	Unknown
9.	*Coelastrum* sp.	Green algae	Unknown
10.	*Cosmarium circulare*	Green algae	Unknown
11.	*Golenkinia radiata*	Green algae	Unknown
12.	*Micractinium pusillum*	Green algae	Unknown
13.	*Pediastrum biradiatum*	Green algae	Unknown
14.	*Pediastrum Boryanum*	Green algae	Unknown
15.	*Pediastrum simplex* var. *duodenarium*	Green algae	Unknown
16.	*Scenedesmus dimorphus*	Green algae	Unknown
17.	*Scenedesmus obliquus*	Green algae	Unknown
18.	*Scenedesmus quadricauda* var. *quadrispina*	Green algae	Unknown
19.	*Staurastrum natator* var. *crassum*	Green algae	Unknown
20.	*Staurastrum paradoxum*	Green algae	Unknown
21.	*Tetrastrum elegans*	Green algae	Unknown

APPENDIX B

SAMPLING AND ANALYTICAL METHODS*

1. Sampling Methods.

a. Particulates.

(1) The standard APCO particulate train used consists of a probe tip, heated glass probe, glass cyclone and glass fiber filter in a heated chamber, four Greenberg-Smith impingers in an ice bath, vacuum pump, gas meter, and calibrated orifice.

(2) Isokinetic sampling conditions ±10% are maintained by controlling pump vacuum in relation to pertinent system parameters so that the velocity of the gas entering the probe tip is equal to the velocity of an S-type pitot tube. Temperature is measured with a Chromel-Alumel thermocouple.

(3) In accordance with Federal incinerator test specifications, the particulate sample is collected at the point of average velocity as determined by a pilot tube traverse. Two sample runs of one hour each were made as required.

b. Moisture.

c. Gaseous Sampling. A Mylar bag sample is collected concurrently with each particulate sample for one hour, maintaining sampling velocity proportional to stack gas velocity for the entire period.

2. Analytical Methods.

a. Particulates. Particulate determination is accomplished by measuring the weight change of the particulate traps in the system. The glass cyclone and the probe are washed with acetone. The washings are combined, dried to constant weight, and a final weight is taken. An acetone blank is also done. The glass fiber filter is dried to constant weight in a desiccator and weighed. The condensible organics collected in the impingers are separated from the water with three chloroform and ethyl ether extractions, dried and weighed. Blanks of chloroform and ethyl are also run. The sum of the weighings minus the blanks gives the final particulate weight.

b. Moisture. Moisture content is determined by weighing the impingers before and after sampling.

c. Gases. A Fisher-Hamilton gas partitioner is used to determine CO_2, O_2, N_2, and CO in the bag samples.

* "Specifications for Incinerator Testing at Federal Facilities" (October 1967) and addendum thereto (December 1967), Public Health Service, Department of Health, Education, and Welfare.

APPENDIX C

SAMPLING DATA FOR: SILENT GLOW INCINERATOR

Procedure: The incinerator was preheated to 1000°F before each run. This was accomplished by letting the auxiliary fuel burn until the burner cutoff switch began cycling. This switch is thermostatically controlled and begins cycling when the primary chamber temperature is approximately 1000°F. The warmup period was approximately 30 minutes.

RESULTS OF SAMPLING DATA

	Run 1	Run 2
Waste charging rate (lb/hr)	153	152
Average stack gas temperature (°F)	425	460
Average stack gas velocity (fpm)	749	677
Average stack gas flow (scfm)*	1168	1010
Draft (inches H_2O)	-0.06	-0.08

Stack Gas Components

	Percent	Percent
H_2O	2.38	6.18
CO_2**	2.61	2.44
O_2	18.7	18.6
N_2	78.7	79.0
Excess air, %	900	900

Particulate Emissions

	Percent	Percent
Rate (gm/sec)	0.011	0.013
Concentration at 12% CO_2 (gr/scf)	0.079	0.129
Percent isokinetic	96.2	105.4
Opacity	40% 2 min 20% 2 min 0% 56 min	40% 2 min 20% 2 min 0% 56 min

*70°F and 1 atmosphere pressure.

**Including CO_2 from auxiliary fuel.

APPENDIX D

PRODUCTION FACILITIES*

Production facilities at Edgewood Arsenal are aimed at chemical materiel and essential mission items required in quantities too small to justify contract procurement (table D-1). As indicated, some of these facilities are inactive and are either in, or are about to be placed in, industrial reserve status.

Tables D-2 and D-3 indicate the actual production accomplished in FY74 and those production operations planned for FY75.

The effluent from these facilities (if any) was considered earlier in this report as were any contaminated facilities.

* This section is appended in compliance with Message 231625Z, AMSAR-ISE, January 1974, Subject: Environmental Assessment Covering FY75 Army Ammunition Procurement Program.

Table D-1. Industrial Operations Division Production Facilities

Building	Short title	Description of use	Remarks
E3516	Experimental Fabrication Shop	Building contains machinery of all types. Area is used to produce prototype models, do experimental fabrication, and test new design. Wind tunnel.	None
E3521	Plastic Fabrication Shop	To vacuum-form, compression-mold, spin-weld and laminate plastic prototypes.	None
E3523	Fabrication Shop	Used as a general fabrication shop to cut and assemble plastic parts.	None
E3525	Plastic and Paint Shop	Plastic-mold components and materials are stored here. A paint spray facility occupies the other section of the building.	None
E5158	Smoke Pot Line and Industrial Reserve Equipment	Used for the production of the M7A1 smoke pot.	To be turned in as excess to Industrial Operations Division needs and placed in standby.
E5185	Industrial Operations Division Production	Primary production facility for Industrial Operations Division, houses presses, shop tools, NC equipment, and other manufacturing equipment.	None
E5440	CS Production	Used as CS loading area.	To be turned in as excess to Industrial Operations Division needs and placed in standby.
E5452	Kit Assembly Plant	Used for production of XM235, M18, and M72 kits.	None
E5604	Protective Equipment Line	Building used for production of protective equipment. Also contains the charcoal filter facilities.	None
E5830	White Phosphorus Assembly	Binary round pilot assembly	None
E5188	Plasticized White Phosphorus Plant	Milling, processing, coating, and loading of plasticized white phosphorus.	
E5032	White Phosphorus Pilot Filling Facility	Small run white phosphorus round filling	
E5625	Chemical Pilot Plant	Chemical agent small-lot production being converted to binary production.	
E5560	Machine Shop	Binary and other munition machining and assembly.	
E3570	Honest John Cluster Plant	Heavy lifting equipment now inactive.	
E5625	Chemical Pilot Plant	Chemical agent small-lot production.	
E3580	Machine Shop	Machining and assembly of experimental and prototype munitions.	
E3330	Pilot Paper Plant	Specialty and short-run paper production to support laboratory and local assembly requirements.	

Table D-2. FY74 – Production

Item	Work accomplished
M17A1 mask	Rework maintenance and refurbishing
M8 burster case	Hardware manufacturing
M10 filter	Production
M25A1 mask	Production
M10 Hawk missile	Filter production
M72A1 SCAITS (simulant chemical agent identification training set)	Production
M11 decontaminating apparatus	Hardware manufacturing
MK 14 canister	Hardware manufacturing
M33 disperser	Hardware manufacturing
Stock fund	Minor secondary items and repair parts program (manufacture)

Table D-3. FY75 – Production

Item	Work scheduled
M10A1 canister	Rework metal parts
MK 14 canister	Hardware manufacturing
M4 impermeable suit	Production
Demilitarization/disposal	Shop work
M12A1 decontaminating apparatus	Rework metal parts
M47 plasticized white phosphorus bomb	Production
M17A1 mask	Rework
M25A1 mask	Production
M11 decontaminating apparatus	Hardware manufacturing
M33 disperser	Hardware manufacturing
M8 burster case	Hardware manufacturing
Stock fund	Minor secondary items and repair parts program (manufacture)